Adjusting To Change:
An Overview of Labour Market Issues In Ontario

Ontario
Ministry of
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ADJUSTING TO CHANGE:
AN OVERVIEW OF LABOUR MARKET ISSUES
IN ONTARIO

Labour Market Research Group
Ministry of Skills Development

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PREFACE

The purpose of this review is to highlight and increase awareness of a number of changes in Ontario's labour market which have ramifications for economic growth, for workers' opportunities to participate in productive and rewarding endeavors and for society's overall standards of living. These changes in the supply and demand for workers outlined in this review gained momentum in the 1980s and will continue into the next decade.

Labour market changes do not occur in a vacuum. Part of this overview examines the economic factors -- international competitive pressures, industrial restructuring, technological innovations -- that generate adjustments in the demands for workers and the skills employers require. The capacity of workers to adjust to changes in labour market demands and whether the adjustment process is smooth or rough are key factors in the adoption of technological innovations and in industrial restructuring.

Trends in labour supply and the demographic characteristics of the work force are reviewed as well as the supply and demand for workers in high-skill technical occupations. Marked changes in labour supply growth and in the age and sex composition of the work force have significant implications for economic growth and for human resource development and management policies and practices.

The availability of qualified workers to fill high-skill technical jobs is also a critical issue in the context of economic growth. An insufficient supply of well-trained and highly skilled workers constrains industrial expansion and employment growth when employers are unable to recruit the qualified workers they need to increase productive capacity in response to expanding market demands.

Executive Summary and Analysis

A number of economic and social factors are creating changes in Ontario's labour market, changes which have major implications for the mix of jobs available to workers, for the skills and levels of training they require, and for the ability of employers to recruit qualified workers.

On the demand side of the labour market, employers, responses to international competitive pressures, which accelerate the pace of technological innovations and lead to industrial restructuring, are at the cutting edge of many of the transformations. The long-term shift underway in the relative importance of employment in the goods-producing versus the service-producing sector of the economy is also affecting the occupational mix and the nature of the skills employers require. On the supply side of the labour market, fundamental changes are occurring in the workforce. Over the next decade the labour supply growth rate will drop substantially, and employers will be recruiting in an environment of labour shortage rather than labour surplus. In addition, the work force is ageing, and women's share of the work force will continue to rise. These trends in labour supply have major implications for human resource development and management policies and practices.

The challenge for Ontario is to encourage employers and workers to place a greater emphasis on training to ensure a high quality and adaptable work force that can cope with the new job requirements arising from technological innovations and industrial restructuring.

A more detailed analysis of the main factors affecting demand and supply in Ontario's labour market is set out below.

Economic Environment

Ontario has one of the most buoyant advanced industrial economies in the world. The last half-decade has been an almost unprecedented period of expansion in real output and employment, which is expected to continue through 1988 and 1989, though at a more moderate pace. Between 1983 and 1987, total employment increased by about 610,000; nearly 90 per cent of the new jobs are full time. The growth in output has been broadly based, even though seven out of every ten new jobs created have been in the service sector. A strong manufacturing recovery has spurred output and employment in a variety of manufacturing-linked services, particularly financial and technical services. Labour markets have tightened across the Province. In some places -- most noticeably Metropolitan areas in Central and Southwestern Ontario -- unemployment rates are falling close to frictional levels. Even though improved economic conditions in Ontario have attracted a record number of migrants from other provinces, employers are experiencing difficulties in recruiting workers in many occupations.

Broad measures of economic performance tend, however, to mask the major challenges that Ontario is experiencing from producers in other countries. As stressed in Competing in the New Global Economy, a report recently released by the Premier's Council, Ontario cannot rest on the laurels of its positive economic record

of the past five years. Rather, in response to the fierce competition from offshore producers, the province must restructure its economy to compete in international markets for more sophisticated high technology and value-added goods and services. The alternative is to face the prospect of a declining standard of living.

One reflection of the tough international competition is the virtual flood of exports from Taiwan, Korea, Hong Kong and Singapore into the domestic markets of advanced industrial economies. Following the footsteps of Japan, these countries are successfully producing and marketing products which involve the use of relatively cheap labour, but they are also introducing a surprisingly large number of products that embody higher technology. International competition is expected to continue to escalate, given the current round of GATT negotiations and the possibility of a bilateral trade agreement between Canada and the United States. If Ontario is to maintain its comparatively high standard of living, it has little option but to meet the international challenges head on. It must improve the competitiveness of its industrial base by stressing innovation and a highly skilled and adaptable work force.

Growing Shortages of Skilled Workers

Employers in Ontario are having difficulty recruiting experienced workers and will continue to do so in 1988 and 1989. Shortages of skilled labour have become an economy-wide phenomenon in this Province.

The available evidence on demand and supply conditions indicates that shortages of qualified workers are heavily concentrated in the following high-skill occupational categories:

- Engineering technologists and technicians;
- Computer systems analysts and programmers;
- Tool and die makers;
- Machinists and machine-tool set-up operators;
- Welders;
- Fitters and machinery and equipment assemblers;
- Installers, repairers, and testers - electrical, electronic and related equipment;
- Pattern makers and moulders;
- Construction trades workers;
- Health care workers;
- Chefs and cooks.

Several factors have come together to intensify these shortages during the current economic expansion. Developing high-skilled workers requires long-term training programs. The cost of such programs is high and the benefits uncertain, so many private-sector employers avoid sponsoring them. The result is an insufficiency of training. As well, apprenticeship and other employer-based training programs were reduced during and immediately after the 1981-1982 recession, further decreasing the number of workers qualified to fill the high-skilled technical jobs now being offered by employers. In addition, Ontario is attracting fewer high-skilled workers from other countries than it did in earlier periods.

Shortages of skilled labour are a critical problem for economic growth. If employers are unable to hire the qualified technical workers they require to increase productive capacity in response to expanding market demands, industrial expansion -- and thus employment growth -- is constrained.

Changes in Labour Supply and Implications for Labour Shortages

In the years ahead, Ontario's employers face a prolonged period of labour shortage, rather than one of labour surplus, and a work force with new demographic characteristics. These realities require changes in human resource management policies and a heavier emphasis on training and retraining of workers if employers are to meet their work force requirements.

Ontario's labour supply is expected to grow at 1.3 per cent per year between 1986 and 1996, a much slower rate of growth than in the 1960s and 1970s. In addition, over this ten year period the work force will age as the mature "baby boomers" (35 to 54 year olds) increase their share of the labour force and younger workers (15 to 24 year olds) become fewer both absolutely and relatively. Further, as the participation rate for women continues to rise, their importance in the labour force will increase.

Shifts in the Industrial Composition of Employment

Even in good times the process of economic change - driven by international and domestic competition, technological change, and changes in final demands for goods and services -- gives rise to changes in the industrial demand for labour.

One of the long-term changes affecting the labour market is the growth of the service sector as disposable income rises over time. Between 1975 and 1987 in Ontario, the service-producing sector's share of total employment rose approximately four percentage points, while the goods-producing sector's share declined correspondingly. As is well known, these shifts between sectors of the economy have major implications for the nature of jobs and the skills required to perform them.

What may not be as well know is that although the service sector's share of total employment has increased significantly, its proportion of Ontario's real gross domestic product has not. In contrast, with a reduced share of employment Ontario's goods-producing sector has come very close to maintaining its importance as a contributor to the Province's wealth and standard of living. These patterns of changing shares of employment and output reflect sharp differences in productivity performance, with above-average productivity improvements in the goods-producing sector and below-average increases in the service sector. To put the point another way, the long-term decline in the relative share of employment in the goods-producing sector does not signal that this sector has become less important to the overall strength of the economy. Rather, slower employment growth in this sector reflects substantial productivity gains as output rises. Further, the strength of Ontario's service sector is very dependent upon a strong goods-producing sector, which directly spurs demand for engineering, repair and maintenance, finance, insurance, testing and laboratory services, and a variety of other services.

Parallelling the long-term shifts between the goods-producing and service-producing sectors is restructuring within sectors in response to both domestic and international competition. In Ontario, industrial restructuring -- and consequent worker dislocation -- has been heavily concentrated in manufacturing, the sector that has been most exposed to international competition as tariff barriers have been reduced through GATT agreements.

During 1981 to 1985, an estimated 73,000 Ontarians per year experienced job loss as a result of business failure, relocation or layoff from which workers were not recalled. Many of them suffered significant adjustment costs in terms of going long periods of time without work or finding only lower paying new jobs. This finding is not unexpected, given the heavy concentration of worker dislocation in the manufacturing sector. On average, workers in manufacturing industries who become redundant are older, have lower levels of education and have earned higher wages than their counterparts in other sectors of the economy, characteristics which point to difficulties in the adjustment process and a below-average probability of finding alternative employment opportunities at their previous level of earnings.

Overall, the process of economic change usually leads to a more efficient use of resources and an economic gain to society. Consequently when restructuring affects workers negatively, the equitable and practical challenge is to reduce their adjustment costs by providing them with training and other assistance to facilitate their movement to new jobs. In light of the multilateral and bilateral efforts underway to liberalize trade further, industrial restructuring is expected to continue in Ontario. Given the future labour supply situation employers face, assisting workers to adjust to changes in the economy will be not only equitable, but almost imperative if labour shortages are to be avoided.

Technological Innovation and Skill Requirements

The adoption and diffusion of technological innovations which lead to improvements in productivity and product quality are key factors in determining the competitive position of Ontario firms in the international marketplace, employment growth and increases in society's standard of living. The introduction of new technologies into the work place, however, changes the existing mix of jobs and requires workers to develop new skills.

Changes to improve productivity and the quality of goods and services can involve the introduction of either "hard" or "soft" technologies. Adopting hard product or process technologies -- more sophisticated machinery and equipment to automate office work (word processors, computerized payroll and management information systems, for example) or goods production (CAD, CAM and programmable equipment) -- requires capital investment by firms and affects both the specific technical skills and the more basic general skills that workers must have. Introducing soft process technologies -- changes in the way people are organized in relation to each other and to the tasks required (quality circles, statistical process control and just-in-time systems, for example) -- changes general skill requirements.

Ontario firms are introducing both kinds of changes at an accelerating pace, with considerable effect on the outlook for the occupational mix of the Ontario economy as well as the skills required of workers. Occupational groups where the demand

for workers will increase include managers, engineers and scientists, engineering technologists and technicians, systems analysts and programmers, and skilled tradespeople.

On the negative side, there will be less demand for unskilled and semi-skilled workers in production-related occupations such as processing, product fabrication and assembly, and materials handling, and for clerical workers, such as book-keepers, accounting clerks, tellers, filing clerks and secretaries.

Despite some evidence of de-skilling of jobs, the strong consensus among employers is that workers will need more skills and more training to achieve proficiency in their jobs. There is also a strong consensus that good basic skills in reading, writing and mathematics, and in interpersonal relationships are becoming much more important for workers, who must cope with the new technologies.

The heightened scale and complexity of innovation will require more training for managerial, professional and technical personnel (to plan and direct the adoption of new technologies) and for workers on the shop floor (to implement and work with the innovations). Without a commitment to training, Ontario's employers will encounter substantial difficulties in investing in new forms of technology that will be needed to survive in a competitive market place.

The sophisticated new process technologies and changes in organization of work also have major implications for the basic skills required of the work force. People who enter the labour force without a good command of basic skills will find themselves competing for the least desirable, lowest paying jobs in the economy. Many people in the labour force will need upgrading of their basic skills. Introducing new technologies to a job frequently increases the levels of mathematics, communication and interpersonal skills required and makes likely a need to develop a conceptual understanding of broader processes. The nature of new equipment and processes being introduced on the shop floor increasingly requires workers to monitor, control, diagnose problems, input information and read from operating manuals and instructions, communicate with their co-workers and work co-operatively to resolve problems. Employees who do not have the basic skills to meet these job requirements will find it increasingly difficult to cope with the demands of the work place.

How well Ontario's employers meet the competitive challenges of the coming years depends in part on the quality of Ontario's work force. The Province will require a better educated, better trained and more adaptable work force than it has had in the past, and providing workers with opportunities to further develop their skills to adjust to new job requirements will be an increasingly important way of avoiding labour shortages.

CHAPTER 1

The Economic Environment and the Challenge Ahead

Introduction

The objective of this review is to increase awareness of changing patterns and trends in Ontario's labour market and the factors driving these changes -- matters that have important implications for economic growth, for the opportunities for members of the work force to participate in productive and rewarding endeavors, and for society's overall standard of living. One change that has significant implications for the demand for labour and the supply of workers is the increasing toughness of the international marketplace; to maintain a competitive edge, Ontario's firms must place a high priority on technological innovations and thus need highly skilled and adaptable workers. Other fundamental shifts involve marked changes in the growth of Ontario's labour supply and the composition of its work force.

This introductory chapter sketches the economic environment within which Ontario must move forward and sets out the challenges to be met. Five chapters follow on important dimensions of the Province's labour market. Chapters 2 and 3 provide an overview of recent developments, a review of occupational labour markets and an identification of the high-skilled technical occupations in which there are shortages of qualified workers. Chapter 4 explores long-term structural changes occurring in the supply and demand for workers in Ontario's economy, while Chapter 5 reviews trends in technological innovations and their effects on jobs and skill requirements.

The Economic Environment

Ontario has an enviable standard of living. From housing to health care, from fashions to financial security, standards are high. Admittedly, the good life is not perfectly distributed among the population or across all regions of the Province. As well, it is possible to find countries, such as Sweden, that perform better on selected social or economic indicators. But it is probable that, on average, Ontarians' consumption of food, shelter, clothing and other necessities and luxuries compares favourably with that of other economies around the world.

The Province's open economy depends heavily on trade, and it has recently been doing well in meeting the challenge of global competition. With an average annual rate of growth in real domestic product of 6.2 per cent during the past five years, Ontario has outpaced the economic performance of Canada overall and that of its major competitors. The employment record has been similarly positive. During the same half-decade, total employment in the Province grew by 610,000, which translates into an annual average job-creation rate of 3.7 per cent -- higher than that achieved by any of the seven major industrial countries of the world.

Nevertheless, there is a pervasive sense of uneasiness about the future which is more than just apprehension about a possible cyclical slowdown following a long spell of economic growth. It is rooted partly in memories of the severe recession of the early 1980s, but it is also a concern has been in the environment since the late 1970s, when the pace of industrial adjustment in Ontario began to quicken --

and the rust bowl appeared in the United States.[1] A realization began to emerge that we were entering turbulent times in which the rules of the game were undergoing a fundamental transformation.

For Ontario, underlying the sense of unease about the future is the realization that one of the key challenges is to compete successfully in a liberalized global trading environment. The alternative to competitive success is a falling standard of living.

This competitive challenge is the subject of a recent study by the Premier's Council, Competing in the New Global Economy[2]. One of its main conclusions is that the economic foundations of Ontario's past prosperity will not remain viable in the future. In the years ahead, Ontario cannot rely on its primary resource sector and mature manufacturing industries as the economy's primary wealth-generators because other countries with substantially lower labour costs will provide too much competition. Rather, for advanced industrial economies such as Ontario's, the source of increased wealth and improvements in living standards must be production with a higher component of knowledge-intensive activities. Already, trade liberalization and shifts in international trade patterns are creating strong pressures to shift resources towards the production of these more sophisticated goods and services.

To make these transitions successfully, however, an economy must invest in ever more complex technological innovations to improve productivity and product quality. A greater emphasis on technologies, in turn, places a high priority on having a well-trained, highly skilled and adaptable work force available to meet employers' human resource requirements; otherwise many of the capital investments will not be possible.

The Global Trading Environment and Changing International Trading Patterns

The changing nature of the world trading environment and increased competitive pressures are primary forces behind the economic and industrial adjustments occurring in Ontario. Over the long term these pressures will dominate the pace of economic change and generate continual uncertainty.

Canada is a member of GATT (The General Agreement on Tariffs and Trade), and Ontario is subject to the reductions in trade barriers negotiated through it. Over the years eight separate rounds of negotiations have reduced tariff levels, on average, from about 40 per cent in 1947 to approximately 5 per cent today. To be sure, there is still a good deal of trade protectionism, in the form of both special tariff-protection provisions and non-tariff barriers, and there are enormous subsidies

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[1] "Rust bowl" is a term used to describe the smokestack belt of the Northeast and Midwest United States, which depends largely on heavy industry, such as steel production and auto-making. This region suffered a sharp decline in the late 1970s that was widely compared to the agricultural decline in the "dust bowl" of the Central United States in the 1930s.

[2] Premier's Council, Competing in the New Global Economy, Report, Vol. 1, (Toronto, April 1988).

in agriculture. Nevertheless, the international trading environment has become surprisingly open and extremely competitive.

The proposed trade agreement between Canada and the United States further elevates the level of economic uncertainty. If an agreement is ratified, it will likely speed the process of industrial adjustment in Ontario and accelerate investments in technological innovations to improve productivity and product quality.

Parallelling the evolution of an increasingly liberalized set of rules governing international trade have been major shifts in trade patterns. The emergence of Japan as a major player in the global marketplace is well known, but it is only one step in the current process of world economic development.

During the past decade, several newly emerging industrial countries (NICs) have sharply increased their trading importance. This progress was initially in less sophisticated standardized products and was based on relatively low wage costs and long-term industrial development strategies, but some of these countries have recently attracted away from Canada and the United States manufacturing facilities involving higher technology products -- a knowledge-intensive segment of industry that had been thought to be secure from low-wage competition. Indeed there has been a virtual explosion of exports to North America from the four Asian Tigers (Taiwan, South Korea, Hong Kong and Singapore). Their sales of manufactured goods into the United States and Canada are increasing almost as fast as Europe's and Japan's are being displaced. The four countries together are currently a larger exporter to the United States than Canada, and if one excludes auto exports, they have overtaken Japan as the top exporter to the United States.

In retrospect, the phenomenon is not difficult to understand. These countries have followed aggressive export-biased policies at home, modelled on the Japanese experience. They rely on undervalued currencies, low wages, and the adoption of up-to-date capital-intensive technology in order to increase their share of world export markets. According to the United States Department of Labor, Korean production workers made about 11 per cent of the comparable U.S. wage level in 1986, and the wages paid in the other Asian NICs were similarly low.[3]

Experience reveals forcefully that in a technologically advanced, competitive world, no country or region can have a permanent economic advantage in any particular industry or product. History also suggests that the economies able to adjust quickly to external developments are the ones that, over time, have the fastest gains in their standards of living. The United States, for example, used to believe that it possessed a natural advantage in the production of high-technology goods, yet that country is currently posting international trade deficits even on these products. North American producers have been recently overshadowed by Japan, but now Japan is on the verge of being displaced by the four Asian Tigers. There will always be a newly emerging industrial country with labour that is incredibly cheap by North American standards.

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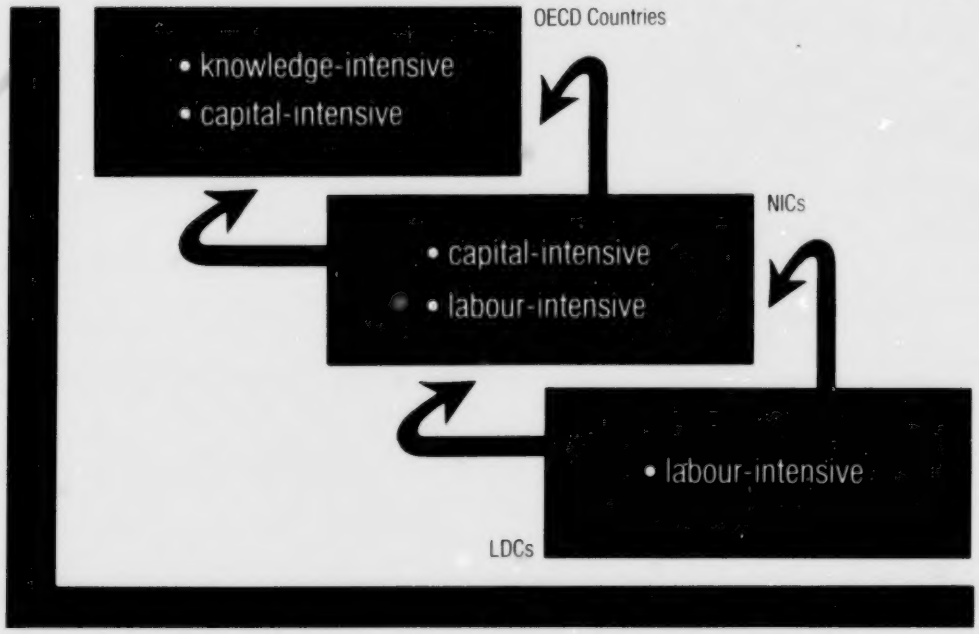
[3]United States Department of Labor, Bureau of Labor Statistics, unpublished data. The comparisons were made using currency-adjusted hourly compensation costs.

To maintain their relative standards of living, advanced industrial countries have no alternative but to meet these competitive pressures head on. A conceptualization of the industrial evolution process is set out in Chart 1. It models the progressive globalization of manufacturing which takes place as shifts occur in specialization: the LDCs specialize in labour-intensive operations because of their abundance of low-priced labour; the NICs specialize in both labour- and capital-intensive activities because they have already built up some economic infrastructure; countries on the third, more advanced tier specialize in knowledge-intensive and capital-intensive industries.

Chart 1

Trading Up: The Development of New Patterns of Specialization in Manufacturing



Source: Adapted from James D. Fleck and Joseph L. D'Cruz, "The Globalization of Manufacturing", Business Quarterly 52 (3) 42.

Ontario's Position and the Challenge Ahead

Despite the inherent uncertainties that accompany a more competitive economic environment, reductions in trade barriers have served Ontario well in terms of opening up export markets and requiring industries to adopt new technologies to remain competitive. International and interprovincial exports of goods and services represented more than half of the Province's gross domestic product in 1986, up from a little more than one-third in 1961.

Increasingly, however, as the NICs, with their low labour costs, continue to gain a larger share of the trade in highly standardized products, the challenge for Ontario is twofold: First, by building on the strengths of its current industrial base, it must improve its competitive position in capital-intensive/labour-intensive manufacturing. Second, to shift upward from these activities to the third tier of manufacturing by developing comparative advantage in knowledge-intensive/capital-intensive high value-added products. To accomplish these objectives will require firms and workers to place a high priority on adopting technological innovations.

It has long been thought that economies with relatively small population bases automatically have difficulties in global trade because of their inability to generate the economies of scale associated with more populous societies. (In fact, Canada's relatively tiny market is often cited as a reason the whole country has difficulty attracting new investments.) That the newer technologies lessen the importance of scale economies in manufacturing has to be regarded as providing Canada and Ontario with a natural economic gain in the present circumstances. Indeed, the application of new technologies, such as flexible manufacturing systems, robots and CAD/CAM, provide great reductions in direct labour costs, increase product and process quality, and improve the flexibility of operations; small customized batches can often be produced as efficiently as standardized items in mass production. This fact is important for Ontario, where the average size of manufacturing plants is relatively small by international standards.

Over the long term, as firms invest in new technologies for capital-intensive/labour-intensive manufacturing and trade upward to knowledge-intensive/capital-intensive activities, one can expect manufacturing's share of total employment to continue to decline relative to the service sector's. This long-term change in relative shares of employment does not, however, signal that manufacturing is becoming less important to the overall strength of the economy. Rather, as discussed in more detail later, slow growth in manufacturing employment reflects substantial productivity gains. As well, expansion in Ontario's service sector is very dependent on a strong manufacturing sector. Growth in manufacturing directly spurs demand for many services, such as advertising, finance, insurance, repair and maintenance of plant and machinery, testing and laboratories, industrial waste disposal and a variety of other professional and technical services. Estimates from the United States indicate that once one takes manufacturing-linked service-producing firms into account, the percentage of employment dependent on manufacturing increases from about 20 per cent (direct manufacturing jobs) to between 40 and 60 per cent of all jobs in the

economy.[4]

To put the matter the other way around, a weak manufacturing base in today's world means a weak service sector, especially in business management services. Consequently, if Ontario's industrial manufacturing base erodes, so will the strength of the service sector and its capacity to compete in the international marketplace.

Clearly, improving the competitiveness of Ontario's present industrial base and trading upwards towards knowledge-intensive/capital-intensive manufacturing activities places a high priority on investments in new technologies. Without these investments it will be difficult to sustain economic growth, expand output and create productive and rewarding jobs. As will be outlined in a later chapter, new technologies and methods for organizing production are already being adopted in Ontario at a considerable pace, and it is expected to speed up over the next couple of years, particularly for advanced process technologies and integrated office-automation systems. Yet compared to major trade competitors such as West Germany, Japan, France, the United States and Switzerland, Canada is lagging in the adoption and diffusion of new technologies. Failure to reduce this lag will jeopardize the competitive position of the economy in the international marketplace.

Implications for Human Resource Development

The adoption and diffusion of new technologies do not occur in a vacuum. Rather, they have major implications for the skills workers require as key players in the successful implementation of innovations. Moreover, although one can reasonably argue that adoption of new technologies contributes to job creation over the long run, the transitions can be difficult for workers. New technologies make some jobs redundant and change the tasks of others. They also create new jobs, but the skills of workers affected by technological change do not always match up to the requirements of the jobs that emerge. When workers are negatively affected by change, the equitable course is to provide them with opportunities for additional training to meet changes in job requirements or to help them transfer to other rewarding jobs.

In fact, in the immediate future and into the 1990s, helping workers adjust to technological innovation will be not only equitable but almost imperative if labour shortages are to be avoided. As observed in Chapter 4, Ontario's labour supply will grow much more slowly during the next decade than it did in the 1960s and 1970s. The Province likely faces a prolonged period of labour shortage; only increased emphasis on training and retraining for members of the work force will enable employers to meet their work force requirements.

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[4]Stepher S. Cohen and John Zysman, Manufacturing Matters: The Myth of the Post-Industrial Economy (New York: Basic Books, 1987). Cohen and Zysman also note that after making the same adjustment in calculating the proportion of value-added that is dependent on manufacturing, the percentage increases from about 24 per cent of gross national product to about one-half of it. Similar estimates for Ontario are not available; if they were, they would almost certainly be in the same range.

Already, as outlined in Chapter 3, Ontario firms are experiencing difficulties recruiting in the domestic labour market, especially for workers to fill high-skilled technical jobs, and many of them are attempting to recruit labour in other countries. Persistent shortages of qualified workers both constrains the capacity of employers to expand output and employment and retards the adoption of new technologies.

Ironically, the projected scarcity of labour is also expected to act as a spur to new capital investments. Recruitment difficulties will make firms even more inclined to substitute capital-intensive technologies for working time, which, in turn, will also require giving a higher priority to training and retraining members of the work force than was given in the past.

Firms seeking to remain competitive in existing product lines and those shifting resources towards more knowledge-intensive activities need the assurance that a well-educated and well-trained work force is available to meet the higher skill-level demands of the new processes. The adoption of new automated production systems, integrated office automation systems, and new approaches to organizing work (such as quality circles and just-in-time systems) affects both the mix of jobs in the economy and the education, training and skills that workers must have.

A broad cross-section of high-level technical skills will continue to be in strong demand. Further, the successful introduction of new technologies into the work place will increasingly require that workers command good basic skills in reading, writing, mathematics, communication and interpersonal relations, as well as a capacity to understand relationships between processes and to analyze problems. This reality has major implications for both new labour force entrants and people already in the work force. Entrants who are not well prepared in basic skills face a high risk finding themselves in dead-end low-paying jobs. Some experienced workers will also require upgrading in basic skills if they are to adjust to new job requirements.

CHAPTER 2

An Overview of Ontario's Labour Market

This chapter provides a brief overview of developments in Ontario's labour market for the past five years. Employment trends across industries, labour force growth and changes in unemployment over this period of strong economic growth are highlighted. The chapter concludes with a review of Ontario's short-term economic prospects.

Economic Performances: 1983-1987

Since the severe economic downturn of the early 1980s, Ontario has enjoyed five consecutive years of rapid growth in output and employment -- expansion that is expected to continue through 1988 and into 1989, though at a more moderate pace than during the past five years. Between 1983 and 1987 real gross domestic product (GDP) and employment increased at average annual rates of 6.2 and 3.7 per cent respectively.[5]

The robust economic growth in Ontario is attributable to a rapid expansion of exports of goods and services, as well as sharp increases in consumer spending, a strong demand for housing and an improvement in business investment in new facilities, machinery and equipment. Ontario has an open economy highly reliant on exports. International and interprovincial exports of goods and services represented 52.1 per cent of Province's GDP in 1986, compared to 44.6 per cent in 1970 and 39.3 per cent in 1961. The expansion of exports has been driven by growth in international exports (the relative importance of interprovincial exports has been declining). Ontario's international exports amounted to $62.0 billion in 1986, compared to $41.7 billion in 1983. The principal trading partner was the United States, which received about 89 per cent of the Provinces' international exports in 1986. This strong export performance has been important to the buoyancy of the economy.

As shown in Table 1, in the last half-decade total employment increased by 610,000, a figure that represents the creation of 153,000 additional jobs per year. Nine out of ten (89.3 per cent) were full time. Further, the economic recovery has been broadly based across industries. In the goods-producing sector, the industries which contributed most to job creation were manufacturing and construction, averaging 26,000 and 18,000 per year respectively; in the service-producing sector, the community, business and personal services industries posted the largest employment gains, averaging 54,000 new jobs per year (36 per cent of total employment growth).

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[5]Between 1983 and 1986 (the period for which data are available for international comparison) the average annual rate of growth in real domestic product for Canada as a whole was 4.2 per cent. This exceeded slightly rates of growth in the United States (4.1 per cent) and Japan (3.9 per cent) and considerably outpaced those in other European countries such as France (1.5 per cent), Italy (2.6 per cent), West Germany and the United Kingdom (both 2.7 per cent), and Sweden (2.8 per cent). [The sources of the data are Organization for Economic Co-operation and Development, Main Economic Indicators (Paris: OECD, various issues), and the Conference Board of Canada].

Table 1

Contribution to Employment Growth by Industry Sector, Ontario, 1983-1987

	Employment		Net Change in Employment, 1983-1987	
	1983	1987	Level	Contribution to Employment Growth
	(000s)	(000s)	(000s)	%
Goods producing	1,367	1,547	180	29.5
Agriculture	136	122	-14	-2.3
Other primary industries(a)	48	60	12	2.0
Manufacturing	935	1,038	103	16.9
Construction	203	274	71	11.6
Utilities	45	53	8	1.3
Service-producing	2,728	3,160	432	70.8
Transportation & communication	244	263	19	3.1
Trade	678	806	128	21.0
Finance	250	302	52	8.5
Community, business and personal services	1,287	1,504	217	35.6
Total	4,096	4,706	610	100.0

Note: (a) Includes mining, forestry, fishing and trapping.

Source: Statistics Canada, The Labour Force, Cat. No. 71-001

Over the period 1983-1987, seven out of every ten jobs created in Ontario were in the service-producing sector. Differences in employment growth between the service- and goods-producing sectors of the economy are determined partly by variations in output growth and productivity improvement. Table 2 provides estimated growth rates in employment, output and labour productivity by industry sector.

Table 2
Relationships Among Employment, Output and Labour Productivity by Industry Sector
Ontario, 1983-1987

	Average Annual Rate of Growth (%)		
	Output (b)	Employment	Labour Productivity (c)
Goods-producing	7.7	3.1	4.4
Agriculture	3.3	-2.6	6.2
Other primary industries (a)	11.4	5.9	5.7
Manufacturing	7.8	2.7	4.9
Construction	10.2	7.8	2.2
Utilities	4.0	4.2	-0.2
Service-producing	5.3	3.7	1.5
Transportation & communication	4.7	1.9	2.8
Trade	8.0	4.4	3.5
Finance	7.2	5.1	2.4
Community, business and personal services	3.8	4.0	-0.1
Public administration	1.3	1.5	-0.1
Total	6.2	3.7	2.6

Notes: (a) Includes mining, forestry, fishing and trapping.
(b) Measured in real GDP
(c) Measured in real GDP per employed worker.

Sources: Statistics Canada, The Labour Force, Cat. No. 71-001, and The Conference Board of Canada.

The goods-producing sector outpaced the overall economy in output growth (an average annual rate of 7.7 per cent compared to 6.2 per cent) but was behind it in employment, which increased less rapidly (3.1 per cent per year compared to 3.7 per cent per year). The explanation is that a large part of this sector's strong output growth came from substantial productivity improvement, which averaged 4.4 per cent

per year. In contrast, the service-producing sector increased its real output by less than the overall rate, its employment growth was average, but its labour productivity grew by only 1.5 per cent per year.

The major industry groupings within each sector also showed considerable variation in employment, output, and productivity. In the goods-producing sector, manufacturing output increased healthily; a substantial part of this growth is attributable to a large improvement in productivity, since employment growth was quite low. In construction, the second largest goods-producing industry sector in Ontario, both output and employment expanded very rapidly. In the primary industries, except agriculture, real output soared; although employment increased respectably, a large part of output growth came from improved productivity performance. For the utilities, employment and output growth were roughly equal, signalling a lack of productivity improvement in recent years. Employment in agriculture experienced a net decline while real output increased somewhat, resulting in strong productivity growth of 6.2 per cent per year.

In the community, business and personal service industries, the near equality of employment growth and output growth reflects the very labour-intensive nature of these industries and their consequent poor productivity performance. In contrast, the strong output growth in trade and in finance is clearly attributable to improved productivity performance. In the transportation and communication industries, employment growth was relatively small, but real output increased notably because of significant productivity improvement. Both employment and real output growth in public administration maintained a slow pace, and productivity growth was negative.

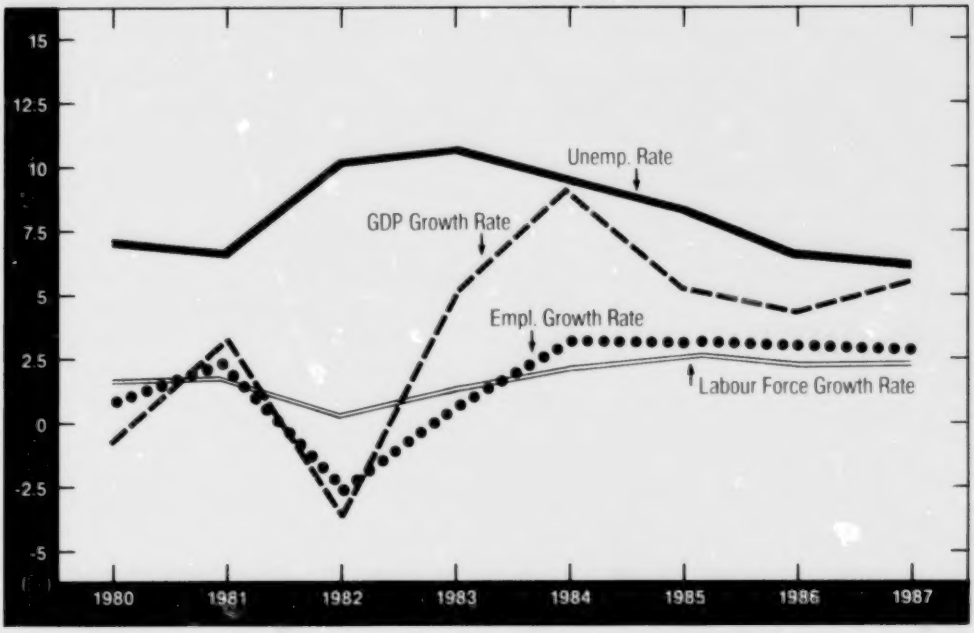
This review of recent patterns in output, employment and productivity reveals that simply saying that the service sector now creates more jobs in Ontario than manufacturing does is not equivalent to saying that the growth in manufacturing has become less important as a contributor to society's standard of living or job creation in the total economy. If a sector's productivity gains are high, its output can accelerate, even though its job-growth rate does not. As well, statistics on employment changes across broad industry sectors mask underlying linkages between the sectors. As noted in Chapter 1, manufacturing activities spur output and employment growth in many manufacturing-linked services, and a strong service sector is dependent on a strong manufacturing sector.

Recent Changes in Ontario's Labour Supply: 1983-1987

Between 1983 and 1987, while Ontario's employment was growing at an average annual rate of 3.7 per cent, its labour force was expanding at the much lower average annual rate of 2.3 percent. The result has been a substantial decline in the provincial unemployment rate (from 10.4 per cent in 1983 to 6.1 per cent in 1987) and thus a marked tightening of labour markets. These patterns and their relationship to changes in Ontario's economic growth are shown in Chart 2.

Chart 2

Rate of Growth in Labour Force, Employment, Output and Unemployment Rate, Ontario, 1980-1987



Sources: Statistics Canada, The Labour Force, Cat. No. 71-001, and the Conference Board of Canada

Sources of Labour Force Growth

The growth in Ontario's labour force over the 1983-1987 period is attributable to three main factors: a continued increase in the proportion of women who enter the labour force; the movement of the baby-boom generation into the prime-age population cohort; and a net gain from interprovincial and international migration.

Overall, as the large number of baby-boomers moved into older age cohorts, prime-age workers (25 to 44 year olds) accounted for about four-fifths of the total increase in the labour force during the last half-decade. The labour force participation rate of women in this age group increased by 1.4 per cent per year and their number in the work force rose by 4.5 per cent per annum (see Table 3).

Table 3
Sources of Labour Force Growth
Ontario 1983-1987

	Annual Rate of Growth (%)		
	Working Age Population	Labour Force Participation Rate	Labour Force
Total	1.7	0.7	2.3
Male	1.7	0.1	1.8
Female	1.7	1.3	3.0
15-24 year olds	-1.0	1.4	0.3
Male	-0.7	1.4	0.6
Female	-1.3	1.4	0.1
25-44 year olds	3.0	0.6	3.7
Male	3.1	0.1	3.1
Female	3.0	1.4	4.5
45-54 year olds	1.0	0.8	1.7
Male	0.7	-0.2	0.6
Female	1.1	2.4	3.6
55-64 year olds	1.3	-0.4	0.9
Male	1.6	-1.6	-0.1
Female	1.0	1.6	2.7

Source: Statistics Canada, The Labour Force, Cat. No. 71-001.

The number of older workers (those aged 45 and over) in the labour force increased at a much slower pace, while the labour force participation rate for older male workers continued to decline. The youth labour force (15 to 24 year olds), despite continued increases in their participation rates, increased only marginally as the population of this age group declined steadily.

During the economic expansion Ontario has become a net receiver of migrants from the rest of Canada (in contrast, it was a major net supplier of migrants to other regions of Canada between 1977 and 1982). From 1983 to 1987, the annual average net gain from the rest of Canada was 37,300 individuals per year. About 59 per cent of them came from the Western provinces, 27 per cent from Quebec and 14 per cent from the Atlantic provinces. (However, the net number from Quebec has been gradually declining.)

The movement of people to Ontario from other parts of Canada and other countries is an important determinant of changes in the Province's labour supply. It is estimated that net interprovincial migration contributed about 18 percent to Ontario's labour force growth over the 1983-1987 period. Over the same period, international migration netted Ontario 25,200 people per year and contributed about 13 per cent to its labour force growth.

Employment and Unemployment

All age-sex groups in Ontario's labour force have benefitted from the job creation of the economic expansion. As shown in Table 4, there have been very marked declines in unemployment rates since 1983.

Table 4
Employment, Unemployment and Unemployment Rate
by Age and Sex
Ontario, 1983 and 1987

	1983			1987		
	Employment	Unemployment	Unemployment Rate	Employment	Unemployment	Unemployment Rate
	(000s)	(000s)	(%)	(000s)	(000s)	(%)
Total	4096	474	10.4	4706	307	6.1
Male	2328	271	10.4	2679	153	5.5
Female	1768	203	10.3	2067	154	6.9
15-24 year olds	885	192	17.8	986	107	9.8
Male	447	114	20.3	513	61	10.6
Female	439	79	15.2	473	46	9.0
25-44 year olds	2023	197	8.9	2430	139	5.4
Male	1137	107	8.6	1343	65	4.6
Female	886	90	9.2	1087	75	6.4
45-54 year olds	686	48	6.5	753	34	4.3
Male	414	26	6.0	436	14	3.2
Female	272	22	7.4	316	19	5.8
55-64 year olds	432	35	7.5	461	25	5.1
Male	281	23	7.5	291	12	4.0
Female	151	12	7.6	170	12	6.8

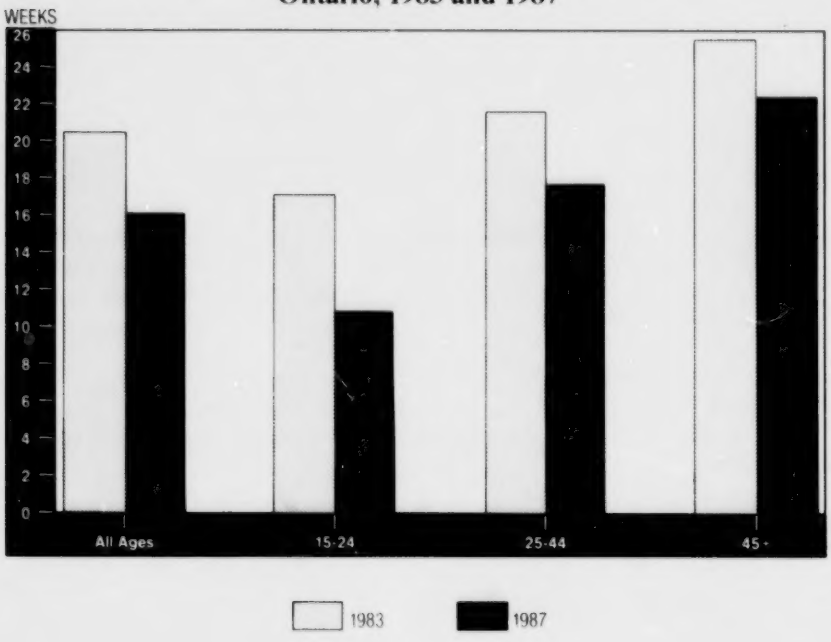
Source: Statistics Canada, The Labour Force, Cat. No. 71-001.

Another important indicator of the state of the labour market is the length of time unemployed people spend looking for work. The average duration of unemployment fell from approximately five months in 1983 to four months in 1987 (see Chart 3). For youth, the average duration of unemployment had reached 10.8 weeks in 1987, while it remained highest for older workers (22.3 weeks).

Underlying this decline has been a dramatic change in the relative importance of unemployment categories over the past five years. Short-term unemployment (four weeks or less) has become more important than long term (fourteen weeks and more) for most workers, the exception being older workers for whom long-duration unemployment is still most common.

Chart 3

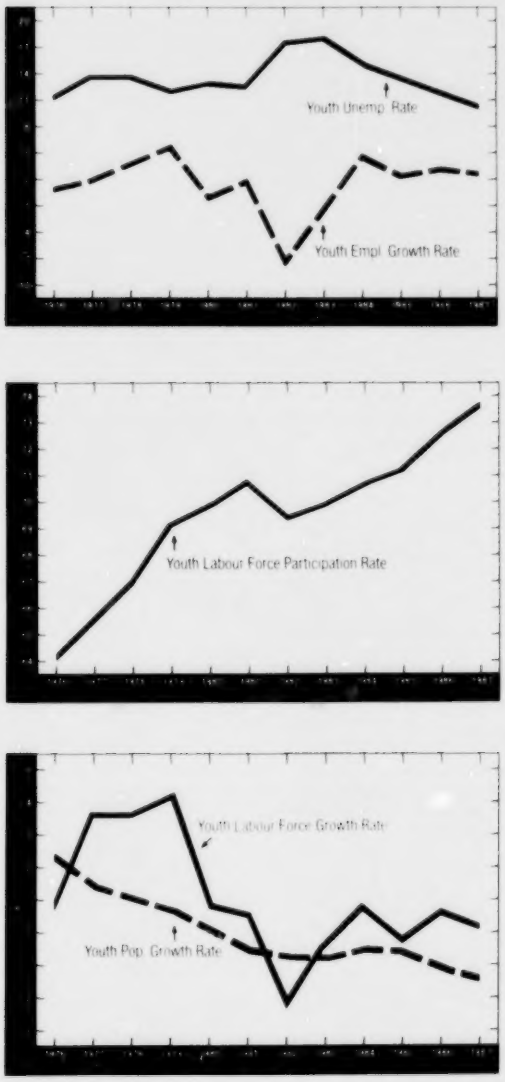
Average Duration of Unemployment by Age Group, Ontario, 1983 and 1987



Source: Statistics Canada, The Labour Force, Cat. No. 71-001

Demographic trends underlie some of the very marked decline in the youth unemployment rate, as is clear in Chart 4.

Chart 4


Youth Unemp. Rate
Youth Empl. Growth Rate
Youth Labour Force Participation Rate
Youth Labour Force Growth Rate
Youth Pop. Growth Rate

Factors Affecting the Youth Unemployment Rate, Ontario, 1975-1987

Source: Statistics Canada, The Labour Force, Cat. No. 71-001.

Declining growth in the youth population was in evidence by the second half of the 1970s, but at that time a sharp increase in the youth labour force participation rate overwhelmed the demographic effect and led to positive growth in the young labour force. Employment growth during this period kept the youth unemployment rate fairly stable in the 11 to 13 per cent range. The severe recession, of course, gave rise to a dramatic increase in the incidence of unemployment among young people, even though negative population growth and lower labour force participation rates led to negative labour force growth for them between 1981 and 1982.

In the post-recession period of the 1980s, the dominant factor has been negative growth in the youth population. The impact of this variable has outweighed the effect of positive increases in youth labour force participation and led to much lower growth in the youth labour force. From 1983 onwards, the youth unemployment rate tracks downward, a movement attributable in large part to the demographic trend since employment growth for youth has been very moderate and is in a range similar to that observed in the second half of the 1970s. As will be discussed in Chapter 4, these trends in the youth population and labour force are expected to continue into the 1990s.

Regional Labour Force Characteristics

During the current economic expansion, employment growth has been broadly based across all regions. Table 5 provides estimates by region for the years 1984 and 1987. Between these two years the incidence of unemployment has fallen in every region, although the dynamics of the decline varies.

In Northeastern and Northwestern Ontario, population and labour force participation rates have been relatively stable. As a result, the size of the labour force has increased slowly and moderate increases in employment have brought about marked decreases in the unemployment rate. In contrast, the Central and Southwestern regions and, to some extent, Eastern Ontario have had very substantial increases in the working-age population, labour force participation rates and the size of the total work force. Employment gains have, however, outpaced rapid labour force growth to bring about declines in the unemployment rate.

For a number of metropolitan areas -- Toronto, Kitchener-Waterloo, Hamilton and Oshawa -- labour markets have become very buoyant, and unemployment rates have moved down towards frictional levels (see Table 6).

Table 5
Estimates of Labour Force Characteristics by Economic Region
Ontario, 1984 and 1987 (annual averages)

		Population 15 Years Old & Over	Labour Force Participation Rate	Labour Force	Employment	Unemployment Rate
		(000s)	(%)	(000s)	(000s)	(%)
Ontario	1984	6,921	67.4	4,668	4,245	9.1
	1987	7,279	68.9	5,013	4,706	6.1
Eastern Ontario	1984	953	67.3	641	584	9.1
	1987	1,015	68.2	692	644	6.9
Central Ontario	1984	4,359	68.6	2,990	2,735	8.5
	1987	4,587	70.4	3,232	3,059	5.4
Southwestern Ontario	1984	997	66.1	569	600	9.0
	1987	1,043	67.1	700	653	6.9
Northeastern Ontario	1984	440	60.4	266	226	14.9
	1987	451	60.1	271	242	10.7
Northwestern Ontario	1984	171	65.0	111	101	10.8
	1987	179	66.1	118	109	7.7

Source: Special tabulations based on Statistics Canada, The Labour Force, Cat. No. 71-001

Table 6
Unemployment Rate by Metropolitan Area in Ontario, 1983 and 1987

	Unemployment Rate (%)	
	1983	1987
Ottawa-Hull	8.4	7.4
Sudbury	14.9	11.4
Oshawa	10.5	6.4
Toronto	9.0	4.5
Hamilton	11.9	6.3
St. Catharines-Niagara	15.7	9.3
London	9.6	7.0
Windsor	14.3	9.2
Kitchener-Waterloo	9.9	5.6
Thunder Bay	11.4	8.2

Source: Statistics Canada, The Labour Force, Cat. No. 71-001

Short-Term Economic Outlook

The current expansion of the Ontario economy is expected to continue through 1988 and 1989 with output growth above the 3 per cent range and additional jobs being created at well above 100,000 per year. That pace may be more moderate than we have seen in the past five years, but it is certainly brisk. Major contributors to the increase in output will be business investment in plant and equipment, residential construction, and consumer spending and strong external trade. For 1988, Ontario's real GDP is forecast to increase by 3.7 per cent with 180,000 additional jobs being created. The provincial unemployment rate will decline further to 5.1 per cent as employment growth continues to outpace labour force growth.[6]

With the outlook for continuing economic expansion and a very robust labour market, employers can expect to experience problems recruiting workers, especially skilled workers.

[6]Ministry of Treasury and Economics, 1988 Ontario Budget, April 1988.

CHAPTER 3

A Review of Labour Markets for High-Skill Technical Occupations

As outlined in the previous chapter, the rapid expansion of Ontario's economy since 1983 has led to employment growth, broadly based across industries and regions, that has outpaced the growth of the labour force. Substantial declines in unemployment rates have benefited all age-sex groups and moved unemployment close to frictional levels in metropolitan areas in Central and Southwestern Ontario.

The buoyancy of the labour market has left many employers experiencing recruiting difficulties. A recent study, Human Resource and Training Needs in Ontario's Machinery and Equipment Manufacturing Sector, documents shortages of skilled workers in manufacturing, especially at the top end of the skill spectrum -- general machinists, tool and die makers, CNC operators, milling machine operators, welders, fitters and assemblers.[7] The Technical Service Council says firms are encountering considerable problems in recruiting experienced personnel in such areas as software engineering, computer assisted design, automated manufacturing, just-in-time systems, computer programming and systems analysts, accounting, engineering and science.[8] The Toronto Star reports that the Province's house builders are predicting that shortages of high-skilled construction trade workers will become more severe because a large proportion of them will reach retirement age in the near future.[9] An article in the Canadian HR Reporter indicates that critical shortages of workers in sales, clerical, secretarial, health care, retail, food service and blue-collar occupations have forced employers to beef up hiring incentives.[10]

Labour shortages in so many occupations are an important issue. They will constrain economic growth since employers are unable to hire the qualified workers they need to increase productive capacity in response to expanding market demands. This is especially the case when high-skilled technical jobs cannot be filled; such shortages create bottlenecks in the economy.

This chapter reviews the labour market situation for high-skilled technical occupations and explores a number of factors contributing to the recurring shortages of skilled workers for jobs that have a long-term training horizon. The emphasis is on occupations that require one year or more of specific vocational preparation but not necessarily completion of a formal university degree.

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[7] Ministry of Skills Development, Human Resource and Training Needs in Ontario's Machinery and Equipment Manufacturing Sector, (Toronto: The Ministry, December 1987).

[8] "Candidates Choosey As Jobs for Professionals Increase," Quarterly Release, first quarter 1988, Toronto.

[9] "Labour Crisis Looms as Tradesmen Near Retirement", The Toronto Star, January 30, 1988 p. E1.

[10] "Recruiting Gets Tough in Tight Labour Markets", Canadian HR Reporter, January 11, 1988, p. 3.

Basis for Analysis

For assessing occupational shortages, it is important to analyze both the supply of qualified workers and employers' demands for these workers. In an ideal world of perfect information, analysts would be armed with comprehensive information on both these dimensions. As pointed out in an earlier discussion paper, however, there are no precise, comprehensive data bases available which one can use for this purpose.[11] Rather, it is necessary to assemble information from a variety of sources, and piece together data on occupational labour markets. Of necessity, many of the statistics used are derived from administrative records (for example, unemployment insurance claimants by occupation) developed for the operation of programs, rather than the production of precise labour market statistics. Consequently, one must exercise some caution in using the data for interpreting supply and demand situations and drawing conclusions on whether or not a shortage exists for a specific occupational category.

For the analysis presented in this chapter, the primary sources of information used to assess the supply and demand for workers by occupational categories are outlined below. The first five sources listed provide insights into the demand side of the market.

Labour Market Needs Surveys from Community Industrial Training Committees (CITCs). These surveys, conducted by Ontario's CITCs and focus on employers' demands for workers in specific occupations and industries.[12] Although individual surveys are restricted to particular geographic areas, the forty-four CITC reports used covered a substantial portion of the Province.[13] The surveys underlying these reports were undertaken between 1986 and 1987.

Labour Market Needs Assessments from Community Colleges and Canada Employment Centres. As part of the overall planning process to identify training requirements for funding under the Canada - Ontario Training Agreement, each community college submits an annual assessment of labour market demand in its geographical area to the Ministry of Skills Development. For a similar purpose each Canada Employment

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[11] Labour Market Research Group, Ministry of Skills Development, Assessment of Occupational Shortages in Ontario's Manufacturing and Construction Industries, (Toronto: The Ministry, Fall 1987).

[12] The CITCs are community-based committees of employers and labour representatives which advise the Ministry of Skills Development on training issues and programs and provide information on the labour market needs of their communities. The Ministry provides funding to these committees to cover their administrative costs and the costs of conducting surveys of employers.

[13] These forty-four reports covered the following geographic areas: Metropolitan Toronto and York Region, Hamilton-Wentworth, Brant, London, Windsor, Niagara, Simcoe, Kingston, Ottawa-Carleton, Renfrew, Sault Ste Marie, Grey-Bruce, Thunder Bay, Fort Frances, Collingwood, Sudbury, Kapuskasing, Timmins, Leeds and Greenville, Hearst, Cambridge, Lambton, Quinte Community, Wallaceburg, Kirkland Lake and District, and Red Lake-Ear Falls.

Centre (CEC) submits an annual assessment of labour market demand in its area to Canada Employment and Immigration (CEIC) - Ontario Region. The analysis here used the colleges' and CECs' assessment submitted in 1987.

CEIC Employment Authorizations. Data on authorizations granted to individuals to work in Canada resulting from employers' requests to recruit workers offshore provide an insight into those occupations for which employers are experiencing difficulty in recruiting skilled workers in the domestic labour market. To qualify for an authorization to recruit workers offshore employers must demonstrate to CEIC that they have not been able to fill their vacant jobs from the available domestic labour supply. These employment authorization data were analyzed for 1986 and 1987.

CEIC's National Job Bank. Employers submit job orders to local Canada Employment Centres; any unfilled after two weeks are listed (with their geographical location) in the Job Bank. This inventory of job vacancies is another source of information about employers' demands for labour (although its comprehensiveness varies, of course, with the extent to which employers in different regions of the Province use the employment exchange services of local CECs). For this review of occupational shortages, National Job Bank reports were examined for the period January 1986 through January 1988.

Community Colleges' Graduate Placement Reports. The annual reports from the community colleges on the job placement rate of graduates also reflect the state of the market for specific occupations. If very high proportions of graduates are finding jobs related to their programs of study, one may conclude that labour demand in those related occupations is very strong. Data on the placement rate of graduates by program of study are available from 1980 to 1986.

For assessing the supply side of the market, the following primary sources were used.

Unemployment Insurance Claims. Statistics on active unemployment insurance (UI) claimants classified by the occupational category of their previous jobs provide a measure of the availability of workers in specific occupations. For a number of construction trades, a subset of these data was examined to obtain an insight into the availability of workers who are referred to jobs through union hiring halls. The analysis of unemployment insurance claimants was undertaken at two levels of aggregation and for two time frames. For broad occupational categories, statistics for the 1983-1987 period were examined; for specific occupations within these categories, data were analyzed for the third and fourth quarters of 1987.[14]

CEIC Reports on Immigration to Ontario. Statistics on immigrants into Ontario by intended occupation were also reviewed to assess the importance of this source of labour supply for meeting employers' requirements for skilled workers. Data for the 1984-1987 period were examined.

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[14]Specifically, using the classification system of the Canadian Classification and Dictionary of Occupations, the four-digit level was used for statistics on active unemployment insurance claimants between 1983 and 1987 and the seven-digit level for the data from the third and fourth quarters of 1987.

Data from the Apprenticeship Branch, Ministry of Skills Development. Data on 1980s apprentice enrolments and completions by trade were reviewed to assess the contribution of this source of supply in meeting employers' demands for qualified workers in high-skilled technical jobs.

Major Findings

Data from all the sources described above were assembled and analyzed to assess demand and supply conditions in the markets for high-skill technical occupations in the Ontario economy. A total of 159 occupations are identified where the evidence indicates employers are encountering difficulties in recruiting the skilled workers they require. These occupations, which are listed in Appendix I at the end of this report, are heavily concentrated in the following areas:

Engineering technologists and technicians;
Computer systems analysts and programmers;
Tool and die makers;
Machinist and machine-tool set-up operators;
Welders;
Installers, repairers and testers - electrical, electronic and related equipment;
Pattern makers and moulders;
Fitters and machinery and equipment assemblers;
Construction trades;
Health care workers;
Chefs and cooks.

In all these occupational categories, there has been a substantial reduction in the number of experienced workers available to meet employers' additional demands. The numbers of UI claimants whose previous jobs were in these groups declined markedly between 1983 and 1987. In many cases, employers are endeavouring to resolve their skilled labour shortage problems by recruiting workers from other countries. The magnitude of recruiting difficulties intensified substantially in 1987 as the labour market tightened further.

It is revealing to glance more closely at the evidence on supply and demand for these groups and some of their components.

- Shortages certainly exist for occupations such as tool and die maker, cabinet maker, machinist, millwright, machine builder and industrial mechanic. A review of employment authorizations attributable to employers' offshore recruiting activities reveals an increase in the frequency of these authorizations between 1986 and 1987 -- an indication that employers are encountering difficulties in finding these workers in the domestic labour market and that the situation has been getting worse. Data from the National Job Bank and CITC surveys for 1986 and 1987 provide additional evidence that employers had job openings in these occupations and were encountering recruitment difficulties. Labour market needs assessment reports from local CECs and community colleges indicate that economic growth and replacement needs are expected to create many job openings through 1988 and into 1989.

- For occupations involving the installation, repair and testing of electrical and electronic and related equipment, the same patterns exist.

- For occupations such as plastics-moulding machine setter and wood-making machine set-up operator, the evidence also indicates that employers require additional workers and are encountering recruiting difficulties. Although few employers were seeking authorization in 1986 and 1987 to recruit such specialized workers offshore, the UI data for the third and fourth quarters of 1987 show that there were relatively few unemployed workers in Ontario who had previous work experience in these occupations. The labour market needs assessment reports point to continuing job openings in these occupations.

- The labour market situation for employers seeking qualified workers in the construction industry trades is also a difficult one. Jobs are available for electricians, refrigeration and air conditioning mechanics, plumbers, carpenters, bricklayers and tile setters, but the number of qualified Ontarians ready to take these additional jobs, as measured by the number of tradespeople available through union hiring halls in the third and fourth quarters of 1987 was quite low. In 1986 and 1987, however, only a small number of employers recruited offshore for workers in the construction trades, a situation that is probably partly attributable to the requirement that an individual have a certificate of qualification to work in a number of these trades. The situation is not expected to improve in 1988 or 1989.

- Employers' requests for people qualified to work as technologists and technicians in architecture, electronic engineering, industrial engineering and mechanical engineering were appearing regularly in the National Job Bank in 1986 and 1987, and very high proportions (88 per cent or more) of 1987 community college graduates in programs associated with these occupations found employment within three months of completing their studies. In both 1986 and 1987, many employers recruited workers from other countries to fill jobs in these occupations, a pattern that is expected to continue given the strong anticipated demand for technologists and technicians.

- With respect to nurses and occupational therapists, both National Job Bank data and CITC surveys indicate that employers are constantly searching for qualified people and are encountering recruiting difficulties. Many employers are going offshore to find workers to fill jobs in these occupations, again a pattern that is not expected to change in the near future.

- Employers also have job openings for cooks and chefs, especially cooks for foreign foods, and are encountering difficulties finding them in the domestic labour market. Demand for qualified people for these jobs will continue to be strong, and employers' recruitment problems are not expected to ease in 1988 and 1989.

Industrial Expansion

A key factor determining the demand for skilled workers in technical occupations is the pattern of overall industrial expansion. Employment growth has been particularly strong in the following industries: aircraft and aircraft parts manufacturing, office and household furniture manufacturing, sash, door and other

millwork planing, motor vehicle parts and accessories manufacturing, the automobile fabric accessories industry, metal rolling, casting and extruding, the fabricated structural metal industry, office and store machinery manufacturing, and machinery and equipment manufacturing. Since these industries employ a large proportion of available skilled technical workers, their rapid expansion has resulted in a strong demand for people qualified as aircraft mechanics, cabinet makers, upholsterers, tool and die makers, machinists, machine tool set-up operators and pattern and mould makers. Similarly, the construction boom has created a strong demand for construction trades workers, such as bricklayers, tile setters, carpenters, plumbers, electricians and air conditioning and refrigeration mechanics.

Bottlenecks

Additional evidence on shortages of workers in specific skilled technical occupations and on the critical nature of the problem is available from a number of industry sector studies. The Ministry of Skills Development's study of Ontario's machinery and equipment manufacturers demonstrates these points quite well.[15] This sector, which constitutes one of the foundations of Ontario's economy and is the Province's third largest manufacturer in terms of employment and the fourth largest in terms of shipments, is encountering problems in recruiting workers in a variety of high-skilled occupations. The resulting problem for firms in the sector is obvious, but the difficulty does not stop there. Rather, it trickles through the economy. The machinery and equipment manufacturing sector supplies a wide range of products -- metal working machinery, pulp and paper machinery, food processing machinery, equipment for mining, construction and material handling, metal valves, and sawmill and wood-working machinery, to name a few. These products are essential to other key sectors of the economy, including plastics manufacturers, the automotive industry, the tooling industry, food and beverage industries, chemical products industries, pulp and paper mills, mining, construction, utilities, oil refineries, forest products industries and furniture and fixture industries. Shortages of skilled workers in the production of machinery and equipment mean capacity constrains in that sector that will lead to bottlenecks and delays in bringing new production facilities on stream in other parts of the economy.

A recent study on the Canadian automotive repair and service industry describes another kind of bottleneck.[16] There is a serious shortfall of qualified automotive mechanics and motor vehicle body repairers. The shortage situation is compounded by the fact that many mechanics and technicians who work in the service and repair of automobiles do not have sufficient up-to-date skills to serve the needs of the market. Recent technological innovations -- in new materials, in design, in emission control and most significantly in electronics -- have changed the service and repair skills required of automotive service technicians. The shortage of a higher level of skilled technicians is creating bottlenecks for automobile manufacturers and the service and repair industry.

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[15]Ministry of Skills Development, Human Resource and Training Needs in Ontario's Machinery and Equipment Manufacturing Sector (Toronto: The Ministry, December 1987).

[16]Employment and Immigration Canada, A Human Resource Study: Canadian Automotive Repair and Service Industry (Ottawa, 1988).

Given the importance of these key manufacturing and service industries as employers of workers in high-skilled technical occupations and the pivotal role of these workers within the industries, persistent shortages of qualified workers will continue to act as bottlenecks, imposing constraints on economic growth. Employers will not be able to recruit the skilled workers they need to increase productive capacity in response to growth in market demands. This point, which is too important to dismiss lightly, is one that has been made elsewhere. For example, evidence that labour shortages can impose real constraints on industrial expansion and employment growth was presented to the Parliamentary Task Force on Employment Opportunities for the '80s.[17] As well, the Automotive Industry Human Resources Task Force pointed out that the difficulties of many employers in the automotive parts industry in hiring adequate numbers of workers for jobs in high-skilled technical occupations has led to losses in production that cannot be recouped at a later date.[18]

Factors Contributing to Skills Shortages

Clearly, Ontario's employers must find some solution to the shortages of skilled workers if the economy is to continue to grow. One way in which many of them try to do so is by recruiting outside the country. This solution to skilled labour shortages has, however, become increasingly difficult to exercise. Over the period 1984 to 1987, the numbers of immigrants coming into Ontario who reported high-skilled technical occupations as their intended occupation were small. This situation reflects the increasing standards of living and buoyant economic conditions in those countries from which Canada has drawn traditionally many of its skilled workers in the past, as well as tighter Canadian immigration quotas. Both factors are making it increasingly difficult to recruit workers abroad.

Another reason for the shortage of workers in many high-skilled technical occupations is that training opportunities to develop these workers depend to an important extent on employers' training initiatives, which tend to be sporadic and vary with the business cycle.

For example, apprenticeship training programs are an important source of qualified workers for skilled trades. The amount of apprenticeship training provided by employers is adversely affected by the business cycle. During economic downturns, apprentices are usually among the first workers laid off because of seniority rules; their training is put on hold, thereby reducing the supply of skilled workers in the longer term. Also, new training opportunities do not come open during a period of economic downturn. Consequently, when the economy moves from recession into a

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[17] Parliamentary Task Force on Employment Opportunities for the '80s, House of Commons, Work for Tomorrow - Employment Opportunities for the '80s (Ottawa, n.d.).

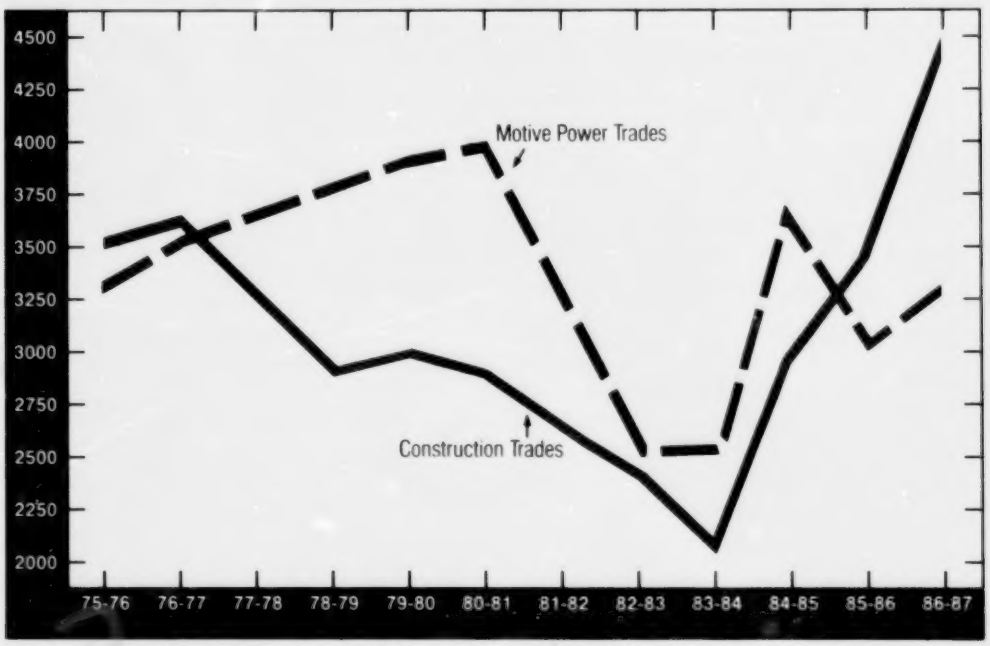
[18] Employment and Immigration Canada. Human Resources Study; Automotive: Report of the Automotive Industry Human Resources Task Force (Ottawa: Ministry of Supply and Services Canada, 1986).

period of economic growth, employers quickly begin to experience recruiting problems in occupations for which apprenticeship training is an important source of supply.

Evidence on this point is presented in Chart 5 which shows the number of apprentice registrations in construction and motive power trades over the last twelve years. Apprentice registrations in construction trades exhibited a long-term decline from 1976-1977 to 1983-1984; thereafter, the trend reversed itself reaching a high in 1986-1987. This pattern is parallel to overall activity in the construction industry, which was virtually stagnant before the economic recovery. Paralleling the business cycle, apprentice registrations in motive power trades declined from 1980 to 1984, and thereafter the trend reversed. Registrations in 1987 for the movtive power trades, however, were still below the pre-recession level.

Chart 5

Apprentice Registrations in Construction Motive Power Trades, Ontario, 1975-1987



Source: The Apprenticeship Branch, Ministry of Skills Development.

Note: Estimates of apprentice enrolments for 1981-1982 were interpolated to allow for abnormalities in the time series that arose from changes in data management.

Since the training programs for many of these trades are four or five years in length, a long-term decline in intake during an economic recession means that the supply of skilled workers from the apprenticeship programs continues to decline during the first few years of economic expansion, making the shortage an even more difficult one.

Cutbacks in employers' training of workers during a recession are also documented in a study of employer-sponsored training programs in Ontario.[19] The researchers found that a number of employers had cancelled their training programs during the 1979-1983 period. The two reasons most frequently cited by employers for doing so were "we are now able to meet our needs by hiring qualified trained workers" and "the downturn in the economy resulted in a reduced demand for workers."

In the same study it was found that only approximately 20 per cent of establishments in Ontario provide formal qualifying or upgrading training programs aimed at providing their employees with skills to meet the requirements of a job. This finding raises a fundamental concern about the adequacy of the volume of employer-sponsored training to meet industry's own needs.

Why did 80 per cent of establishments not provide their employees with formal programs? The most frequently given reasons were:

- Informal training meets our needs;
- We lack the capacity for training;
- We prefer to recruit qualified trained workers.

Clearly, resolving shortages of high-skilled workers for technical jobs encounters two major barriers. One is, of course, the cyclical nature of employer-based training initiatives, a barrier which compounds the supply problem during a period of strong, sustained economic growth. The second is the low priority given to the training option by the vast majority of employers in Ontario.

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[19]Ontario Manpower Commission, Training in Industry: A Survey of Employer-Sponsored Programs in Ontario (Toronto: the Commission, April 1986).

CHAPTER 4

Structural Changes in Ontario's Labour Market

This chapter provides a number of perspectives on structural changes in Ontario's labour market. Both past and expected changes in the composition of labour supply are reviewed, and shifts in the industrial composition of jobs are noted. In addition, some insights are provided into the nature of industrial restructuring and the consequent labour market adjustment process.

Changes in Labour Force Composition

Relative to earlier periods, labour supply growth in Ontario has become more moderate. Over the 1975-1987 period, the labour supply increased at an average annual rate of 2.3 per cent, compared to 3.6 per cent in the 1966-1975 decade. This falloff in the growth rate has stemmed mainly from a slowdown in the growth of the working-age population and a substantial decline in the movement of immigrants into Ontario.

Between 1975 and 1987, Ontario's source labour force population (people 15 years of age and over) grew at an average annual rate of only 1.7 per cent, compared to 2.8 per cent for 1966 to 1975. One reason was the comparatively slower growth of the youth component of the population, which began to decline in absolute terms beginning in 1980. In addition, the number of immigrants coming to Ontario declined from a high of 119,800 to 39,300 between Census years 1973-1974 and 1983-1984. It then increased to reach 65,100 in 1986-1987.

Contributing positively to growth in the labour supply were the movement of the baby-boom generation into the prime-age category (25 to 44 years old) and increases in the labour force participation rates betwen 1975 and 1987 of prime-age females from 58.8 to 77.1 per cent and of youth from 65.0 to 73.6 per cent.

These changes in the relative growth of different age groups and in labour force participation rates are making a marked impact on the composition of the labour force. From 1975 to 1987, the proportion of prime-age workers increased from 44.7 to 51.7 per cent while the proportion of youths declined from 25.5 to 21.8 per cent. The proportion of older workers also declined, from 29.8 to 26.9 per cent. Women's proportion of the labour force increased strongly and steadily throughout the period, reflecting the continuing rise in female participation rates.

Labour Force Projection to 1996

These trends in the composition of Ontario's labour force will continue into the 1990s. A projection on labour supply growth and the age-sex composition of Ontario's work force to 1996 is presented in this section.[20] The projection is restricted to people 15 years of age and over, that is, persons of working age who are potentially available to enter the work force.

The key determinants of labour supply growth and of the future age-sex composition

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[20] A technical note on data sources and methodology used for the projections is presented in Appendix II.

of the work force are the underlying trends in demographics and in labour force participation trends. Each of these factors is examined here briefly before turning to the findings of the projection.

Underlying Demographic Trends

Ontario is undergoing fundamental changes in demographic trends which will have major impacts on the growth and composition of its labour force over the projection period (1986-1996). These changes involve much slower population growth and the ageing of the population.

The previous high rate of population growth, attributable to the post-war baby boom and high levels of immigration, has diminished. Throughout the 1960s and 1970s the labour force source population grew at annual average rates of 2.8 and 2.2 per cent respectively. In the first half of the 1980s this growth declined to 1.3 per cent; it is projected to grow only 1.2 per cent between 1986 and 1996.

The baby boom generation will continue passing into the prime-working-age category, and younger age cohorts will be of much smaller size. These are the key factors which influence the age composition of the population over the projection period.

Labour Force Participation Rates

Chart 6 shows past and projected rates for participation in the labour force. The upward trend in female participation rates of the 1960s and 1970s is projected to continue, reflecting low fertility rates, the economic necessity of women's participation in the labour force and the continued expansion of job opportunities in service sector industries.

Male participation rates are projected to remain constant or change slightly among all age groups except men 55 to 64 years of age. For this older group, the participation rate is expected to decline over time because the tendency towards earlier retirement will persist.

Labour Supply Growth and Work Force Composition

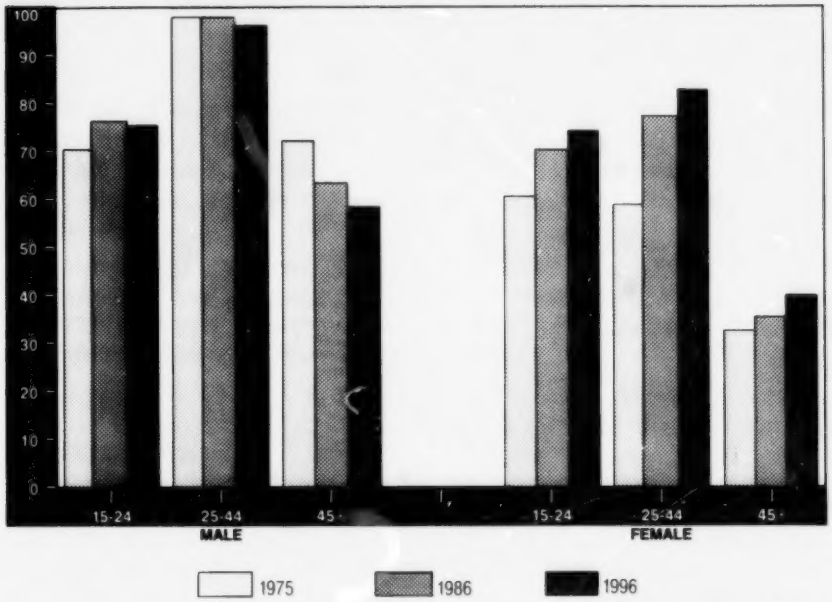
The decline in fertility rates and consequent decline in the size of younger age groups, together with the effect of the baby boom generation's move into older age categories, will result in both a slower labour supply growth and an ageing of the work force over the projection period. The projected labour supply growth, relative to that of earlier periods, is shown in Chart 7, while compositional changes by age are shown in Chart 8.

The main points of interest in the labour force projections to 1996 are highlighted below:

- Ontario's total labour supply is projected to increase from 4,897,000 in 1986 to 5,544,000 in 1996. This represents a much slower rate of growth -- 1.3 per cent per year between 1986 and 1996 -- than the annual average rates of 2.9 and 3.6 per cent that Ontario experienced in the 1960s and 1970s respectively.

Chart 6

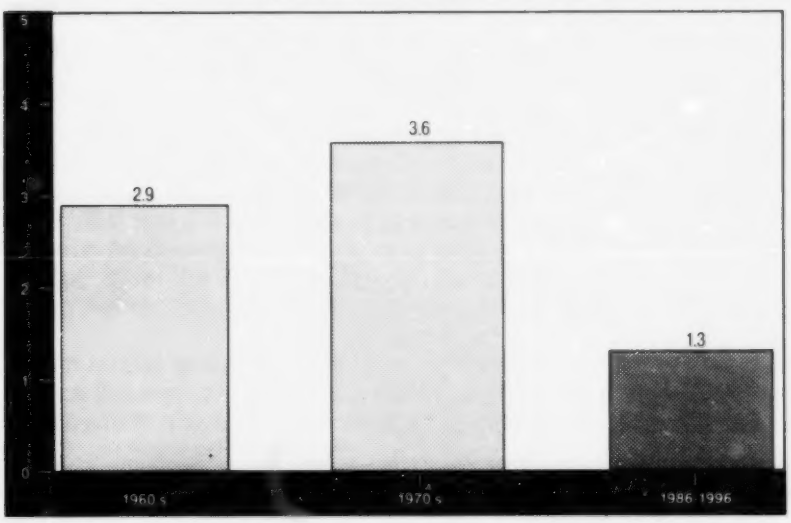
Labour Force Participation Rates by Sex and Age Group, Ontario, 1975, 1986 and 1996



Source: Base year statistics from Statistics Canada; projections prepared by the Labour Market Research Group, Ministry of Skills Development.

Chart 7

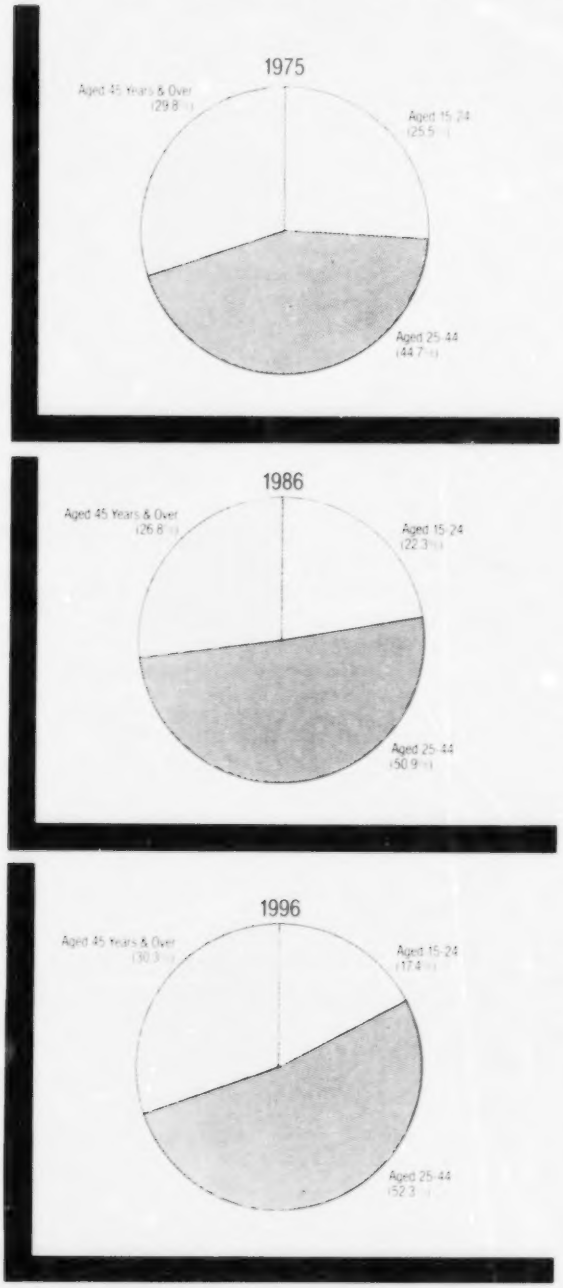
Average Annual Labour Force Growth Rates, Ontario, 1960s, 1970s, and 1986-1996



Source: Base year statistics from Statistics Canada; projections prepared by the Labour Market Research Group, Ministry of Skills Development.

Chart 8

Estimates on Composition of Ontario's Labour Force, 1975, 1986 and 1996



Source: Base year statistics from Statistics Canada; projections prepared by the Labour Market Research Group, Ministry of Skills Development.

- The number of women in the work force will increase substantially as a result of the anticipated rise in female participation rates. Between 1986 and 1996, the female share of the labour force is projected to increase from 43.9 to 46.2 percent.
- Between 1986 and 1996, the ageing of the baby boom generation means that 35 to 44 year olds and 45 to 54 year olds are projected to be the fastest growing groups in the labour force. The share of 35 to 54 year olds in the total work force is expected to increase from 38.5 to 46.1 per cent during the decade.
- The number of older men (55 to 64 year olds) participating in the labour force will decline, although the number of women of the same age group will increase. The relative share in the total work force will fall off noticeably for these men and slightly for the women.
- Young people (15 to 24 year olds) in the labour force are projected to decline from 1,092,000 in 1986 to 967,000 by 1996; their relative share of the workforce will decline.

With slower labour supply growth and an ageing work force, labour will become a relatively more scarce resource. Training and retraining for current members of the work force and those returning to it will become a higher priority.

Shifts in the Industrial Composition of Employment

As noted in Chapter 2, inter-industry differences in the growth patterns of output and productivity underlie the observed shifts in the industrial composition of employment over time. Between 1975 and 1987, the share of Ontario's real gross domestic product accounted for by the service-producing sector increased only marginally -- from 59.6 to 60.1 per cent -- while the output share of the goods-producing sector declined slightly. These relatively small changes in output share give rise, however, to substantial changes in the industrial mix of employment because of inter-industry differences in productivity improvement.

Since the service-producing sector is more labour intensive than the goods-producing sector, the former's share of employment in 1975 (63.2 per cent) was higher than its share of output (59.6 per cent). Further, because productivity growth in the service-producing sector tends to be lower than in the goods-producing sector (0.6 and 2.0 per cent per year respectively in the 1975-1987 period), the service-producing sector's share of employment rises more rapidly than its share of output. Over the 1975-1987 period the service - producing sector's share of employment increased from 63.2 to 67.1 per cent.

These patterns of output and productivity growth and employment growth are shown in Table 7. Notice the very distinct correlation between productivity growth and changes in employment share over the seventeen-year period. Those sectors of the economy with above-average productivity performance reduced their shares of total employment while those with below-average increases in productivity increased their shares.

There are, of course, other factors bringing about shifts in the industrial demand for labour; for example, the rise of disposable income over time is creating an

increasing demand for services and thus contributing to employment growth in this sector. On balance, however, output shares have not changed markedly, a fact that reflects the underlying importance of different productivity performances.

These shifts in employment between seciors of the economy have major implications for occupational demand -- the nature of the jobs and skills to perform them -- available to new labour force entrants and to people who lose their jobs and seek alternative employment opportunities, an aspect of the labour market which is elaborated in Chapter 5.

Table 7
Distribution of Employment and Average Rate of Growth in Employment, Output and Labour Productivity
Ontario, 1975-1987

	Average Employment Growth (%)	% Distribution of Employment		Average Output(b) Growth (%)	Labour Productivity(c) Growth (%)
	1975-1987	1975	1987	1975-1987	1975-1987
Goods-Producing Industries	1.4	36.7	32.9	3.5	2.0
Agriculture	0.6	3.3	2.6	1.7	1.4
Mining	2.6	1.2	1.0	2.2	1.0
Other primary industries (a)	5.2	0.2	0.2	5.7	2.6
Manufacturing	1.5	24.5	22.1	3.6	2.0
Durable goods	2.0	13.3	12.6	3.3	1.2
Non-durable goods	0.9	11.2	9.4	4.1	3.2
Construction	1.8	6.3	5.8	4.9	3.1
Utilities	1.4	1.3	1.1	3.5	2.4
Service-Producing Industries	2.8	63.2	67.1	3.5	0.6
Transportation and communication	2.0	5.8	5.6	3.3	1.3
Trade	2.3	17.3	17.1	4.1	1.9
Finance	3.2	5.8	6.4	4.5	1.4
Community, business and personal services	3.8	27.0	32.0	3.4	-0.3
Public administration	0.8	7.2	6.1	0.9	0.2
Total	2.3	100.0	100.0	3.5	1.1

Note:
a. Include forestry, fishing and trapping.
b. Measured in real GDP.
c. Measured in real GDP per employed worker.

Source: Statistics Canada, The Labour Force, Cat. No. 71-001, and The Conference Board of Canada.

Industrial and Labour Market Adjustment

Ontario has enjoyed substantial economic growth and improvement in labour market conditions since 1983. Yet even in good times the process of economic change, driven by international and domestic competition, technological change and changes in final demands for goods and services gives rise to industrial restructuring and thus to worker dislocation. Some insights into this dynamic nature of the economy and worker dislocation are provided in this section.

One source of intelligence on worker dislocation in Ontario is the information reported to the provincial Ministry of Labour by employers. Under Ontario's Employment Standards Act, employers are required to report to the Ministry of Labour permanent and indefinite layoffs involving fifty or more workers which arise from partial or complete closures of operations. Although these reports provide only a partial picture of industrial restructuring and worker dislocation, they do provide insights into its nature and trends.

As shown in Table 8, the permanent and indefinite layoffs reported to the Ministry peaked in 1982, a year of severe recession, and then declined in subsequent years. The number of workers affected, however, remained at more than 13,000 in both 1985 and 1986 and reached almost 14,000 in 1987, a year of strong economic growth and general prosperity. Further, these permanent and indefinite layoffs are heavily concentrated in the manufacturing sector, the sector which has been most open to adjustment pressures arising from trade liberalization under GATT.

Table 8
Permanent and Indefinite Layoffs Reported to
Ontario Ministry of Labour
1981 - 1987

	Total Layoffs	Layoffs in Manufacturing	
		Number	% of Total
1981	19,724	18,637	94.5
1982	46,047	39,102	84.9
1983	17,213	14,611	84.9
1984	14,824	12,323	83.1
1985	13,902	11,102	79.9
1986	13,565	8,846	65.2
1987	13,925	11,806	84.8

Note: Permanent layoffs are those effected by complete closures; indefinite layoffs are those effected by reduced operation and partial plant closure. In both cases, the layoffs reportable are those involving 50 or more employees.

Source: Plant Closure Review and Employment Adjustment Branch, Ontario Ministry of Labour

Over the complete 1981-1987 period, the incidence of job loss within the manufacturing industries, as reflected by Ministry of Labour data, has been the highest for manufacturers of transportation equipment, primary metal and electrical products and firms involved in metal fabrication and the production of machinery (see Table 9). These industries together accounted for about 80 per cent of total job loss in the manufacturing industries over the period.

Table 9
Cumulative Permanent and Indefinite Layoffs Reported to Ontario Ministry of Labour, Selected Manufacturing Industries, 1981-1987

Industry	Layoffs	Percentage of Total
Manufacturing Total	116,427	100.0
Food and beverage	4,548	3.9
Rubber and plastics products	3,259	2.8
Leather	2,077	1.8
Textile	3,194	2.7
Clothing	2,217	1.9
Wood products	1,351	1.2
Furniture and fixtures	1,392	1.2
Paper and allied	3,440	3.0
Primary metal	17,938	15.4
Metal fabricating	9,422	8.1
Machinery	9,081	7.8
Transportion equipment	31,533	27.1
Electrical products	17,845	15.3

Source: Plant Closure Review and Employment Adjustment Branch, Ontario Ministry of Labour

The heavy concentration of worker dislocation in the manufacturing sector has implications for the severity of problems in labour market adjustment. On average, workers in the manufacturing industries who become redundant are older, have lower levels of education and have earned higher wages than their counterparts in other sectors of the economy, characteristics suggesting that finding alternative employment opportunities which provide the same level of earnings will be difficult for many of these workers.

A more comprehensive picture of the magnitude of the labour market adjustment process generated by economic change can be obtained from a survey undertaken by Statistics Canada in January 1986 to estimate the number of workers who had become redundant over the five-year period 1981 to 1985. For this survey, redundant workers were defined as those who had experienced a job separation

resulting from an employer's going out of business, the closing or moving of a plant, a permanent layoff from which the respondent was not recalled, or the failure of a self-operated business. Special tabulations for Ontario from this survey, which are presented in this section, were prepared for respondents who were 25 to 64 years old as of January 1, 1986. People 20 to 24 years old were excluded because they were 15 to 19 year olds during the five-year recall period of the survey.

It is estimated that approximately 364,000 Ontarians in the age group specified experienced permanent job loss during the five-year period -- an average of 73 thousand per year (see Table 10). Among 25 to 44 year olds, the overall incidence was about 9 per cent; more than half of the workers affected had been in short-tenure jobs (those held for less than three years). The incidence of displacement declined with age but with the proportion of workers with longer years of service increased markedly as one moves through the age distribution to 45 to 54 and 55 to 64 year olds.

Table 10
Incidence of Job Loss by Age and Years of Service
Prior to Permanent Layoff
Ontario, 1981-1985

Age Group	Number of Job Losers	Incidence of Job Loss(a)	Years of Services before Job Loss: Less than Three (%)	Three or More (%)	Average years (%)
25-44	270,000	9.5	57.4	42.6	6.8
45-54	54,000	5.7	37.0	63.0	8.7
55-64	40,000	4.5	20.0	80.0	15.8
Total	364,000	7.8	50.0	50.0	8.5

Note: a) Job loss as a percentage of total population in the corresponding age group.

Source: Statistics Canada, Displaced Worker Survey, January 1986 Survey File; tabulation prepared by the Labour Market Research Group, Ministry of Skills Development.

Some insights into the costs associated with labour adjustment following job loss can also be obtained from Statistics Canada's special survey. For this purpose a rigorous definition of "displaced worker" was adopted by restricting the analysis to workers who had three or more years of job tenure with an employer before permanently losing their job. (Although there has never been a precise definition of displaced workers, the U.S. Employment and Training Administration proposed the

three-year job tenure rule for analytical purposes, and it was followed by Statistics Canada in an analysis of displaced workers.)[21] The rationale for adopting this convention rests partly on the fact that as years of service increase, workers develop strong attachments to their jobs, make more substantial investments in specialized skills and will confront greater difficulties in finding alternative employment if they lose their jobs.

As shown in Table 11, most of the workers with three or more years of service who were displaced between 1981 and 1985 were in the manufacturing sector. Nearly one out of two in the older age group were in this sector, compared to only one out of three younger workers. These findings reflect the same patterns as the data reported to the Ontario Ministry of Labour. In addition, a special Ministry of Labour study of workers affected by plant closures also showed a high concentration of displaced older workers in the manufacturing sector.[22]

One indicator of the difficulty of the adjustment process following displacement is the length of time necessary to find a new job. Because Statistic's Canada's survey of workers covered a five-year period it has the potential to provide a good indication of how long it took for displaced workers to achieve satisfactory re-integration into the workforce. The measure "time-without-work" (a combination of time both actively seeking work plus time when a person was not actively engaged in job search) before finding the next job was used.[23] Table 12 shows that time-without-work increased with age, rising to an average of 35 weeks for 55 to 64 year olds. Clearly, after displacement, it took older workers more time than younger workers to find alternative employment following displacement, and all displaced workers faced a significant period without work.

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[21] See Flaim, P.O. and Sehgal, E., "displaced Workers of 1979-1983; How Well Have They Fared?", Monthly Labor Review 108 (6, June 1985), and United States Department of Labor, "Reemployment Increases among Displaced Workers", News, no. 86-414 (October 14, 1986). Statistics Canada adopted the three-prior-years-of-job-tenure definition of "displacement" in its analysis of the Displaced Worker Survey. See Statistics Canada, Social and Economic Studies Division, "Workers Experiencing Permanent Job Loss: A Survey of their Labour Market Experiences, 1981-1984", mimeographed, September 1986.

[22] Ontario Ministry of Labour, Labour Market Experiences of Workers in Plant Closures: A Survey of 21 Cases, (Toronto: The Ministry of Labour, May 1984). The survey, undertaken during 1983, involved workers laid off in 1980 and 1981. The researchers reported: "Workers aged 45 and over represent 44 per cent of survey respondents as compared with 30 per cent of the employed labour force" (p. 7).

[23] The Statistics Canada Survey covered such a long time period, some respondents had difficulty recalling details of their post-displacement unemployment. For this reason, it is necessary to use "time-without-work" as a measure.

Table 11
Distribution of Displaced Workers
in the Previous Five Years by Industry and Age
Ontario, January 1986

Industry	20-44 year olds	45-64 year olds
Manufacturing	38.0	48.5
Construction	10.3	(a)
Trade	18.3	17.6
Service	15.1	(a)
Other	18.3	14.7
Total	100.0	100.0

Note: a) Reliability of estimates is too low to permit reporting.

Source: Statistics Canada, Displaced Worker Survey, January 1986 Survey File, tabulation prepared by the Labour Market Research Group, Ministry of Skills Development.

Table 12
Time-Without-Work (a) following Displacement, by Age
Ontario, Janury 1981 to December 1985

Age Group	Average Weeks without work
25-44	24
45-54	26
55-64	35

Note: a) Time not working but actively seeking employment and time not actively looking for work.

Source: Statistics Canada, Displaced Workers Survey, January 1986 Survey File; tabulations prepared by the Labour Market Research Group, Ministry of Skills Development.

Special tabulations for Ontario from Statistics Canada's survey provide a unique opportunity to analyze the impact of displacement on earnings. Comparing average weekly earnings from jobs held at the time of displacement to those from the first job obtained after displacement shows that, on average, all age-sex groups experienced income reductions (see Table 13). Overall, men suffered a 14 per cent loss of income, women a 17 per cent loss. In terms of the size of the pay envelope, 45 to 54 year old men had the largest losses, at nearly $100 per week, but even the least adversely affected group, 25 to 44 year old men, suffered a 12 per cent reduction that averaged out at just over $50 a week. To an important extent, these reductions in earnings reflect the movement of workers from higher wage jobs in the manufacturing sector to lower paying jobs in the expanding service sector.

Table 13
Average Weekly Earnings from Job Prior to Displacement and from First Job after Displacement, by Age and Sex, Ontario, 1981-1986 (current dollars)

Age Group	Male				Female			
	Lost Job $	Next Job $	Difference $	%	Lost Job $	Next Job $	Difference $	%
25-44	423	371	51	12	267	220	43	16
45-54	420	324	96	23	244	177	67	28
55-64	488	403	84	17	258	(a)	(a)	(a)
Total	423	364	60	14	157	212	45	17

Note: a) Reliability of estimates is too low to permit reporting.

Source: Statistics Canada, Displaced Worker Survey, January 1986 Survey File; tabulation prepared by the Labour Market Research Group, Ministry of Skills Development.

Finally, being displaced from a job tends to affect future employment stability. This consequence of having experienced displacement appears to be much more serious for older workers. Among the Statistics Canada respondents who were unemployed in January 1986, a much higher proportion of older workers than those in other age groups had been displaced at some time between 1981 and 1985 (see Table 14).

Table 14
Proportion of Currently Unemployed Who Had Been Displaced in Previous 5 Years, by Age, Ontario, January 1986

Age Group	Previously Displaced as a Proportion Currently Unemployed (%)	Number of Unemployed January 1986 (000)
25-44	14.6	171
45-54	19.5	41
55-64	29.6	27

Source: Statistics Canada, Displaced Workers Survey, January 1986 Survey File; tabulation prepared by the Labour Market Research Group, Ministry of Skills Development.

Summary of Main Trends

Dramatic long-term changes are occurring in Ontario's labour supply and in its industrial demand for labour, changes driven by forces that are expected to continue to operate into the foreseeable future. A marked decline in the rate of labour supply growth will continue into the 1990s along with substantial changes in the age and sex composition of the work force, changes which will lead to workers becoming a relatively more scarce resource. Long-term shifts in the relative importance of employment in goods-producing and service-producing sectors will also continue and, in turn, affect the occupational demand for labour.

Given the multilateral and bilateral efforts underway to further liberalize international trade, industrial restructuring in Ontario is expected to continue. This restructuring, in turn, will give rise to labour market adjustments and their associated costs for workers.

CHAPTER 5

Technological Change and its Implications for Skill Requirements in Ontario

In an open economy, technical innovation is a key ingredient in determining competitiveness in the international marketplace and in contributing to productivity, employment growth and a rising standard of living. The consensus is that the adoption of technology is vital to competitiveness and economic and social welfare, but, as will be demonstrated in this chapter, when new technologies are introduced traditional job patterns and skill requirements change. The effects of new technology on jobs are not uniform; jobs can be modified, created or made redundant, and the impacts are frequently uneven across occupations and labour force groups.

This chapter draws upon evidence available from recent studies and research reports for a review of trends in the adoption and diffusion of technologies and their effects on jobs and the skills required for them. Key sources of information include the work of the Ontario Task Force's Employment and New Technology (1985); and Economic Council of Canada's reports on technology and employment (1986 and 1987); and a number of industrial sector studies on human resource and training needs.[24]

The Introduction of Technological Change

Types of Technological Innovations

"Technological change" has become a very multi-dimension concept. The definition employed here is a broad and eclectic one which takes into account not only "hard" product and process innovations, many of which are micro-electronic based, but also "soft" process innovations -- changes in the organization of work, methods of decision-making and design of jobs.

Some of the better known items in the hard category involve the adoption of numerical control and programmable equipment, computer-assisted design (CAD) and

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[24]Ontario Task Force on Employment and New Technology: Employment and New Technology (Toronto: Government of Ontario, 1985) (see also appendices); Gordon Betcherman and Kathryn McMullen, Economic Council of Canada, Working with Technology: A Survey of Automation (Ottawa: Ministry of Supply and Services Canada, 1986); Economic Council of Canada, Making Technology Work (Ottawa: Ministry of Supply and Services Canada, 1987); Economic Council of Canada, Innovation and Jobs in Canada (Ottawa: Ministry of Supply and Services Canada, 1987); Employment and Immigration Canada, Human Resources Study: Automotive: Why People Count (Ottawa: Ministry of Supply and Services Canada, 1986); Employment and Immigration Canada, Human Resources Study: Electrical and Electronics Manufacturing Industry (Ottawa: Ministry of Supply and Services Canada, 1987); Employment and Immigration Canada, Human Resource Study: Canadian Automotive Repair and Service Industry (Ottawa, 1988); Ontario Ministry of Skills Development, A Report on Human Resources and Training Needs in Ontario's Machinery and Equipment Manufacturing Sector (Toronto: the Ministry, 1988).

computer-assisted manufacturing (CAM). Such innovations require capital expenditures and long planning horizons to implement. They have implications for jobs in engineering and design and for high-skilled and semi-skilled jobs in direct production.

Changes in the soft category concern the organization of work and involve such innovations as statistical process control (SPC), quality circles and just-in-time (JIT) production systems. These innovations involve people -- in particular the way people and equipment are organized in relation to each other and to the tasks required. They place a premium on the intellectual and interpersonal skills required for team work and for assuming responsibility for more than a single isolated operation in the production process.

Although there are a wide variety of other new technologies such as biotechnology, laser technology and new materials technology, in this review of technological change and its impact on occupations and skills, the emphasis is on computer-based technologies, which are having the widest ranging effects on employment and skills at the present time. These technologies are summarized in Table 15.

Table 15
Computer Technologies in Canada in the 1980s

Process automation
Automated material-handling systems
Computer numerical control (CNC)
Computer-aided design (CAD)
Automated inspection and quality control

Office automation
Word processing
Personal/computers/workstations
Office networks
Office applications

Other automation
Transportation, communications, and other utilities - specific applications
Health services - specific applications
Point-of-sale (POS) terminals
Other applications

Source: Economic Council of Canada, Innovation and Jobs in Canada (Ottawa: Ministry Supply and Services Canada, 1987), p. 7; based on ECC, Working with Technology Survey, 1985.

Patterns of Technological Change

Research on technological innovations reveals that the patterns of the first and the

second half of the 1980s differ quite distinctly. From a survey of types of automation being introduced by close to a thousand firms in Canada, the Economic Council of Canada concluded that the first half of the 1980s was a period when office automation was the dominant feature of computer-based technological change.[25] Overall, 64 per cent of the innovations introduced between 1980 and 1985 fell into this category; in contrast, process automation applications accounted for only 23 per cent (the remainder were specialized computer applications).[26] These office applications were highly concentrated in stand-alone word processing and personal computer work stations (see Table 16). A very small proportion of establishments invested in the more sophisticated and expensive office networks.

Table 16
Distribution of Firms by Type of Office Automation Introduced
Canada, 1980-1985

	Proportion of Establishments
Word processing	34.5
Personal computers/work stations	42.6
Office networks	8.9
Other office application	25.4
Any office automation	64.6

Source: Economic Council of Canada, Innovation and Jobs in Canada (Ottawa: Ministry of Supply and Services, 1987), p. 72; based on ECC, Working with Technology Survey, 1985.

Although process applications accounted for only 23 per cent of all automation technologies introduced between 1980 and 1985, the incidence was much higher in the manufacturing sector, where close to 43 per cent of establishments surveyed by the Council reported their introduction. Table 17 provides an indication of the level of penetration. These data reveal that the diffusion of process automation was not pervasive up to 1985. Computer-aided manufacturing, which had the highest incidence overall, was reported by roughly one-quarter of all manufacturing establishments; only about one in ten had introduced CAD, automated material handling systems, CNC, or automated inspection and quality control. Significant penetration by the complete range of process technologies was found in only two industries -- machinery and equipment and electrical and electronics products.

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[25] ECC, Innovation and Jobs in Canada, p.7.

[26] ECC, Making Technology Work, p.2.

Table 17
Process Automation in the Manufacturing Sector
Canada, 1980-1985

Industry	Proportion of establishments with					
	Automated Material Handling	Computer Numerical Control	Computer-Aided Manufacturing	Computer-Aided Design	Automated Inspection and Quality Control	Any Process Automation
	(per cent)					
Food, beverages, and tobacco	6.3	6.3	22.9	2.1	8.3	33.3
Rubber and plastics	5.3	5.3	36.8	-	10.5	52.6
Leather, textiles, and clothing	2.1	-	23.4	8.5	2.1	27.7
Wood and furniture	7.1	7.1	14.3	7.1	-	33.3
Paper	17.4	4.3	47.8	4.3	4.3	52.2
Printing and publishing	-	-	15.6	6.3	3.1	25.0(a)
Primary Metals	-	12.5	29.2	12.5	8.3	45.8
Fabricated metals	9.3	20.9	30.2	16.3	9.3	53.5
Machinery	10.3	41.4	41.4	31.0	13.8	65.5
Transportation equipment	14.8	11.1	25.9	11.1	11.1	44.4
Electrical and electronic products	16.7	11.1	27.8	44.4	22.2	55.6
Chemicals	26.9	-	26.9	7.7	15.4	57.7
Other manufacturing	10.0	10.0	20.0	10.0	3.3	33.3
All manufacturing	9.2	9.9	26.5	12.7	8.2	43.0

Note: a) In printing and publishing, many of the process technologies introduced, such as automated typesetting, composition, printing and colour presses, could also be used, on a much smaller scale, in any office; as a result, these were classified as "other" applications. If they had been added to process automation for the printing and publishing industry, the total would be 66 per cent.

Source: Economic Council of Canada, Innovation and Jobs in Canada (Ottawa: Ministry of Supply and Services, 1987), p. 73; based on ECC, Working with Technology Survey, 1985.

The Council reported, however, that a shift towards a greater utilization of process technologies is foreseen for the second half of the 1980s (see Table 18). The proportion of process-based applications is expected to increase to about one-third, while the proportions of office automation applications is expected to decline to one-half. This shift in emphasis towards process applications means a substantial increase in the number of shop floor workers who will have to cope with these technologies. Firms covered by the Council's survey projected that the number of employees using robots, automated inspection and quality control, and computer aided design would more than triple over the 1985-1990 period.[27]

Table 18
The Introduction of Technology
Canada, 1980-1990

	Introduced 1980-1985	Planned 1986-1990
	(percentage of all applications)	
Process Automation		
Automated material handling systems	3.1	4.1
Computer numerical control (CNC)	3.1	3.2
Computer-assisted manufacturing (CAM)	9.2	14.3
Computer-assisted design (CAD)	5.1	8.4
Automated inspection and quality control	2.4	3.5
Sub total	22.9	33.5
Office Automation		
Word processing	17.3	9.3
Personal computers/workstations	25.3	15.4
Office networks	4.5	9.9
Office applications	16.9	16.0
Sub total	64.0	50.6
Other Automation		
Transportation, communications and other utilities-specific applications	1.7	1.5
Health services-specific applications	2.0	3.0
Point-of-sale (POS)	4.7	5.7
Other applications	4.8	5.8
Sub total	13.2	16.0
TOTAL	100.0	100.0

Source: Gordon Betcherman and Kathryn McMullen, Economic Council of Canada, Working with Technology: A Survey of Automation (Ottawa: Ministry of Supply and Services Canada, 1986)

[27] ECC, Innovation and Jobs in Canada, p.81.

Since almost half (43.3 per cent) of the ECC's sample were Ontario firms, these findings have considerable implications for the province. Moreover, they are parallelled by the conclusions of the Ontario Task Force on Employment and New Technology, which undertook an assessment of computer-based technologies on employment levels and job requirements.[28]

In Ontario's manufacturing sector, the Task Force found that a significant number of firms had already put in place technologies such as numerically and computer-controlled machines, robots, computer-aided drafting and computer-aided manufacturing systems and computer and facsimile communication links between head office and plants. Further, firms had extensive plans for adopting a wide range of engineering design, manufacturing planning process and telecommunications technologies between 1985 and 1990. New applications to be adopted included computer-aided design, computer-aided process planning, automated shop-floor data collection, computerized maintenance planning and control systems, computer-aided inspection and testing, computer-controlled machines, robotic applications, just-in-time production and delivery system and computer links between suppliers and customers.

Among the service sector industries surveyed by the Task Force, it was found that computer-based innovations were already extensive. The applications widely in use included word-processing machines, personal computers, microcomputers, main frame computers, data-base management systems, and private automatic branch exchange. In addition, there were a large number of specific applications used by various industries to deliver their services, such as optical scanners and computerized inventory control and ordering systems in retail stores and automatic teller machines in banks and trust companies. As well, many service industries are planning to implement other innovations with specific customer sales and service applications, including computerized service order processing, computerized loan qualification and approval and electronic mail.

Changes in Work Organization

Reorganization of work, job redesign and enrichment, job rotation, quality circles, quality of working life programs and other workplace innovations aimed at improving worker satisfaction, employee involvement, productivity and quality improvements have become very popular notions in recent years. The reality, however, is that most firms in Canada continue to organize production along traditional patterns.

Fewer than one-quarter of the firms surveyed by the Economic Council of Canada had introduced plans to enrich jobs through job redesign or job rotation, and only 13 per cent were using quality circles. The incidence of joint labour-management committees was much higher (30 per cent), but these committees were infrequently used to plan for the introduction of technological innovations into the workplace.[29]

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[28]The Task Force surveyed twenty Ontario industries which contained large shares of occupations likely to be affected by computer-based technologies. The industries chosen for study are listed later in this chapter.

[29]ECC, Innovation and Jobs in Canada, p.93

The Ontario Task Force on Employment and New Technology reached a similar conclusion on the use of consultative employer-employee committees by firms for planning and implementation of new technology. It noted in its report, "Approximately 20 per cent of respondents feel workers should have Full Involvement; conversely, about 20 per cent feel they should have No Involvement; the most frequent roles identified were Information Only, and Prior Consultation."[30]

Factors Impeding Technological Innovations

The explanation for the predominance of office automation over process automation in the first half of the decade is found partly in the comparative cost of the technologies. Much of the office technology that was introduced consisted of stand-alone equipment, which requires considerably lower levels of investment than do process technologies and has compartmentalized, rather than comprehensive effects, on operations. Automated production processes and sophisticated integrated office systems tend to affect whole sets of operations and are more costly and complicated; therefore, they diffuse less quickly.

When firms are asked why they have not adopted new technologies, the reasons most frequently cited, in rank order of importance, are equipment costs and financing and difficulties in recruiting technically qualified personnel. On the other hand, firms are fully aware that competitive pressures, the need for productivity improvements and new products lead to innovations. Office automation is driven fundamentally by productivity objectives, while process technologies are driven by efficiency considerations as well as factors such as the desire to improve product quality and increase control over the production process.[31]

Canada Compared with Other Countries

Comparing the adoption of new technology in Canada and other countries, the Economic Council concluded: "Canada has not compared well with that of our major competitors."[32] It found that Canada ranked sixth among the twenty-two OECD countries and well behind the three leaders -- Japan, the United States and Switzerland. For example, Canada lagged considerably in robot use -- it had 3.7 robots per 10,000 persons employed in manufacturing, compared to Japan's 32.1 and Sweden's 20.2 and was placed three to four years behind the United States in robot technology. Moreover, the level of adoption of process technologies reached in Great Britain, West Germany and France by 1983 was higher than the level attained in Canada in 1985. The level in these jurisdictions varied by size of establishment, just as it does in Canada, but comparisons across size categories showed Canada substantially behind Germany and, to a somewhat lesser extent, Britain and France, in each size category.

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[30]Task Force on Employment and New Technology, Employment and New Technology, p. 137

[31]ECC, Innovation and Jobs in Canada, p. 71

[32]ECC, Innovation and Jobs in Canada, p.78.

Recognizing that Canada has some notable technological strengths -- telecommunications, large-scale engineering, agriculture, forestry -- the Economic Council concluded that the solution to closing the gap in technological innovation does not lie with a few advanced industries and firms but with the majority of producers who are slow to adopt innovative practices.[33] The goal is, therefore, for more Canadian firms to embrace technological change and to be prepared to invest in machinery and equipment and in the training of people to work with the new technology.

The Impact of Technological Change on Occupational Mix and Skills

Several inter-related and long-standing issues arise when one reviews the impact of technological change on employment. These include the debate about how technological change affects the overall level of employment, the occupational mix and specific functions and skills within occupations.

With respect to overall employment, the empirical evidence is that the net effect of productivity gains during a period of technological innovation is positive. Although change in work methods brought about by technological change both eliminates some jobs and creates new ones, it also leads to higher productivity, incomes and consumer spending and thus to increased overall final demand and employment.

Technological innovations do give rise to changes in the relative importance of occupations in the economy. In some cases whole categories of jobs become completely redundant. In broad terms, the Ontario Task Force identified the following trends for the occupational mix:

- The shift from blue-collar to white-collar occupations will continue, in part because a high proportion of new jobs will come from service-related industries.

- There will be relatively more demand for managerial and administrative occupations and for occupations in natural sciences, engineering and mathematics.

- Professional and technical personnel who will be particularly in demand include production and financial managers, engineers, engineering technologists and technicians, systems analysts and computer programmers.

- High-skilled trades personnel who will be in demand include machinists, industrial machinery mechanics, tool and die makers and equipment installers and repairers.

- There will be relatively less demand for semi-skilled and unskilled production-related occupations in the areas of processing, product fabricating and assembling, and materials handling.

- Although the number of jobs in clerical and sales occupations will grow over the next ten years, they are likely to have much slower employment growth rates

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[33] ECC, Making Technology Work, p.6.

than in the 1970s. Within this group, occupations likely to be negatively affected include bookkeepers, accounting clerks, cashiers, tellers, secretaries, typists and filing clerks.

It is difficult to generalize about technological innovations effect on the skill component of occupations because it is uneven. Specific tasks within jobs are affected differently, even between firms in the same industry and certainly across industries. Although new or upgraded skills will be required in many occupations, technology may also have the effect of de-skilling -- reducing the skill component required -- for certain jobs. (People whose jobs are de-skilled may, however, be required to take on additional tasks to compensate for the loss of their original tasks, or their jobs may become part-time, as in the case of some service sector occupations.)

From industry-sector studies, the Ontario Task Force found that most firms predict the multi-skilling effect will be more important than de-skilling. The adoption of new technology will require workers to have more skills and more training to achieve proficiency and to know more about their firm's operations.[34] Identified as needing higher level skills were a wide range of managerial, professional, technical and skilled trades occupations (see Table 19). Most companies also see good basic skills -- basic reading and writing, mathematics and applied science, communication and interpersonal skills, analytical and problem-solving skills and computer literacy -- as being very important for workers who must deal with the change and uncertainty brought on by technological change.

As noted earlier, the next several years will bring to Ontario a faster rate of adoption of new technologies, particularly of advanced and integrated office automation systems and a variety of advanced production processes. The introduction of microelectronic-based equipment has already directly affected the skills required of white-collar workers. In the future it can be expected that new skills will be required of a greater number of blue-collar workers including those in high- and medium-skilled occupations, as the number of people working with robots and integrated process production systems will rise dramatically.

Specific Industry Sector Impacts

The effect of technological change on the occupations and skills required by specific industries was considered by the Ontario Task Force on Employment and New Technology.[35] It examined a representative sample of service sector industries containing large shares of occupations believed to be vulnerable to the impact of technology and of manufacturing industries in which computer-based automation, including process technologies, had been introduced. Firms were asked to identify those occupations where they expected to experience a shortage, or conversely, a surplus of workers in the next five years.

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[34] Task Force on Employment and New Technology, Employment and New Technology, pp. 124-126.

[35] Ibid. (see both main report and appendices 12-18).

The service industries studied included chartered banks and trust companies, insurance, government service, telecommunications and cable, retail trade, computer services and business management consulting. Overall, a surplus of workers was anticipated in a large variety of clerical occupations, while shortages in the managerial and systems analysts occupations were expected by a third or more of all organizations. There was a high degree of consensus that technology will increase the skill-level requirements of most occupations in the service sector industries in the future.

Table 19
Impact of New Technology on Skill Levels of Selected Occupations in Selected Industries
Ontario, 1985-1995

Occupations Identified as Needing More Skills (a)

Managerial and Administrative: managers, personnel officers, government administrators, and government inspectors.

Natural Sciences, Engineering and Mathematics: scientists, engineers, engineering technologists and technicians, draftsmen, systems analysts, and computer programmers.

Clerical and Sales: clerical supervisors, statistical clerks, insurance clerks, library file clerks, claim adjusters, office clerks, secretaries, typists, clerk typists, word processing operators, bookkeepers, accounting clerks, EDP equipment operators, stock clerks, receptionists, information clerks, sales supervisors, and insurance salesmen.

Production-Related Processing Occupations: machining foremen, machinists and machine tool set-up men, fabricating, assembling and repairing foremen, electrical equipment fabricators and assemblers, electronic equipment fabricators and assemblers, electrical equipment installers and repairers, industrial machinery mechanics and repairmen, and fabricating and assembling inspectors and testers.

Note: a) Identified by 50 per cent or more of responding firms.

Source: Ontario Task Force on Employment and New Technology, Employment and New Technology (Toronto: Government of Ontario, 1985).

The manufacturing industries examined included iron and steel, metal fabricating, machinery and equipment, aircraft and aircraft parts, communications equipment, office, store and business machinery, and plastics processing. Although some firms identified the possibility of surplus in certain occupations -- largely material handling, processing and assembly -- shortages of skilled personnel in the future were reported as likely for most occupations, including:

- o managerial, administrative and related occupations
- o engineers
- o engineering technicians and technologists
- o systems analysts and computer programmers
- o tool and die makers
- o machinists and machine tool set-up, and
- o various installation and repair occupations.

As well, there was a high degree of consensus among manufacturers that technology will increase the skill levels required for most occupations.

Another source of information on technology's industry-specific impacts on jobs is the report of the Canadian Automotive Industries Human Resources Task Force released in 1986.[36] In order to enhance its position vis-a-vis Japanese and Korean competitors, the automotive industry is undertaking major technological innovation. As part of an overall strategy, the industry is planning to match Japanese innovation in production management and the use of computerized automation, to restructure its parts sourcing system, to improve product technology, and to experiment with innovative approaches to management/labour relations.

This strategy, coupled with current changes taking place in the industry, is having direct implications for skill requirements: "Although skills are declining in some areas, skill requirements in the industry generally are rising -- workers and managers are being required to master more skills than ever before, use these skills more frequently in their daily work, and to adapt these skills more often to changing situations."[37] The report identifies training needs in basic, analytical, interpersonal and technical skills.

The electrical and electronics industry is also introducing fundamental changes in the ways products are assembled and manufactured. The evolution in generations of technology from electromechanical technologies to electronics has changed the occupational and skill mixes required by firms. The new production technologies are changing the traditional demarcation between designers, tool makers and machine set-up operators. Shop floor workers, although having to do less craftsmanship

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[36] CEIC, Why People Count.

[37] Ibid, p. x.

work, are being called on to be more oriented to problem-solving and to perform a wider variety of tasks. The report notes that the trends towards "down-skilling" and "multi-skilling" are coinciding with a need for employees to be more analytical and flexible. It observes: "There may be a need for fewer unskilled, semi-skilled and administrative workers since these are the ones most exposed to displacement caused by the introduction of new technologies. There will be a greater need for technical, design, engineering, sales and marketing employees in order for companies to respond quickly to changing market opportunities. There will also be a need for skilled service and maintenance personnel to diagnose and solve problems as they occur."[38]

A report on Ontario's machinery and equipment manufacturing sector found this sector has been slow to adopt new and advanced forms of technology, largely because the systems are costly and because some owners, managers and workers have been reluctant to embrace new technical and work organization techniques, not only on the production floor but also in design and engineering shops.[39] As a result of this sector's reliance on traditional production and management techniques, few of its employees with traditional skills have been displaced; neither has there been a large demand for highly skilled professional and technical staff to implement new systems. However, the technological change that has occurred has started to affect the nature of the skills required within various jobs -- more emphasis is being placed on multi-skilling and on-site problem-solving.

In addition, many companies in the sector plan to undertake significant technological innovation in the next five years or so. The strongest growth is anticipated in computer-aided process technologies, CAD, CAE, CAM, integrated CAD/CAM and inspection/testing. Machinery and equipment manufacturers are also planning to expand their use of computerized management systems and new forms of work organization. Thus, as this industry expands over the next few years, it is expected that there will be both an increase in its demand for skilled workers in the blue-collar trades, such as metal machining, fabricating and assembly trades, and that workers in these trades will have to acquire new skills. Strong demand is also forecast for such highly skilled occupations as industrial engineers, maintenance apprentices, quality assurance and control technicians and applications programmers. Declines are foreseen for first-line supervisors, material handlers, shipping and receiving clerks and skilled and unskilled maintenance workers.

Survey results are also available from a study on the Canadian automotive repair and service industry.[40] Because of the industry's recent technological changes -- in new materials, in emission controls and most significantly in electronics and diagnostics -- the skills required of mechanics and technicians are changing dramatically. It is estimated that over the next ten years, the traditional technologies will disappear and the skills for servicing the older vehicles will no longer be needed. Mechanics and technicians will increasingly require a higher level

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[38]ECC, Electrical and Electronics Manufacturing Industry, p. x.

[39]Ministry of Skills Development, Ontario's Machinery and Equipment Manufacturing Sector.

[40]ECC, Canadian Automotive Repair and Service Industry.

of basic education and technical skills.

It is clear that technology will affect the work force of various firms and industries in significant ways. Just as clear is the need for training in response to these anticipated changes.

Implications of Technological Change for Literacy

The increasing pace of technological innovations has important implications for the basic skills possessed by existing members of the labour force and by new entrants. The successful introduction of new technologies into the workplace frequently requires that workers possess a good command of basic skills -- reading, writing, mathematics, and communication and interpersonal skills. In a recent study, the Canadian Business Task Force on Literacy makes a number of key observations.[41]

- Jobs requiring a low level of skill are at risk for displacement from the introduction of hard technologies, such as automated warehousing, computer-assisted manufacturing and robotics, as well as soft technologies, including semi-autonomous work groups, which may require fewer numbers of workers.

- The new technologies are affecting the types of skills workers must have; for example, computer-based technologies require levels of comprehension and ability above those previously required.

- As responsibility for the quality of production is being decentralized to the level of the work station, workers are increasingly required to operate in monitoring, controlling and analytical modes.

- New technology is requiring that individuals on the shop floor be more literate than they were in the past. They must be able to read instructions, diagnose problems, input numbers and read from operating materials. They must be able to communicate problems with their fellow workers and use analytical thinking to arrive at solutions.

- The basic skill levels required for entry-level positions are rising. Many firms now require a minimum of Grade 12 education for entry-level positions.

- Upgrading and training are becoming more important in most industries. School-leaving illiterates are in an increasingly vulnerable position if they are unable to comprehend this training.

Illiteracy in the workplace poses problems for industry. The Canadian Business Task Force on Literacy spelled out some of them: lower productivity, excessive supervisory time, increased health and safety risks, inconsistent product quality, lack of trainabilty, poor employee morale and greater direct training costs to firms

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[41] Business Task Force on Literacy, Measuring the Costs of Illiteracy (Toronto, February 1988).

who must upgrade their employees. It is estimated that illiteracy costs Canadian corporations about $10.7 billion a year through lost productivity, industrial accidents, direct leaving costs, lost earnings, unemployment expenses and adult education costs.

The extent of functional illiteracy in this country has been documented in a recent study based on a survey of 2,398 adults across Canada.[42] The "functionally illiterate" are defined as people who possess limited literacy and numeracy skills that are insufficient for functioning in a modern society. It was found that 24 per cent of Ontarians are functionally illiterate (the rate would be even higher if certain groups, such as natives on reservations, transients and people in penal institutions, had been included in the sample). An estimated 17 per cent of the paid workforce in Canada are functionally illiterate (no separate breakdown for Ontario was given), and these workers are distributed across a large range of occupations.

Young people who enter the labour force ill prepared to compete for jobs in a technologically advanced society pose serious problems for themselves and society. This issue was dealt with recently in a report by George Radwanski on student dropouts from Ontario's highschools.[43] Without a good command of basic skills and the minimum of a highschool diploma, the new entrant will be relegated to the lowest paying and least desirable jobs in the economy. Radwanski noted the current dramatic rise in the degree to which society must rely on its educated members and on the education system itself. In an internationalized global economy, goods can be produced wherever production costs are lowest, generally in developing countries. Similarly, it is possible for sophisticated service activities to be carried out in any industrialized society, and "the key competitive variable will become the quality of the work force, that is, the level of knowledge, skills, adaptability, ingenuity and motivation possessed by the people in any given society."[44]

From the results of these studies, the conclusion is inescapable: the evolving occupational and skill requirements of the economy mean that greater attention has to be paid to high levels of educational attainment and to the acquisition of basic skills by existing and future members of the labour force. As the profile of the labour force continues to shift towards the older age brackets and as technological change continues to take hold, the ability to engage in continuous learning will become a necessity for many workers in Ontario.

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[42]Southam, Inc. Literacy in Canada: A Research Report (Ottawa: Southan, 1987).

[43]George Radwanski, Ontario Study of Relevance of Education and the Issue of Dropouts (Toronto: Ministry of Education, 1987).

[44]Ibid., p. 11.

Implications for Skills Development and Training

The evidence presented in this chapter makes it clear that technological innovation significantly affects the occupational mix and the skill sets workers require to carry out their jobs. As demonstrated, occupational shifts are occurring in the economy as the service sector continues to increase its share of total employment and as the pace of technological innovation accelerates in both the service- and goods-producing sectors. The shift from blue-collar to white-collar employment is expected to continue, and with it will come a greater demand for managerial and professional staff. In the manufacturing sector, high-skilled technical jobs will grow in importance, and low-skilled and semi-skilled jobs will decline. Consequently, a greater investment in education and training will be required as the demand for more highly trained personnel increases.

Technological change is also having a significant impact on the skill sets workers require. Although there is evidence of some de-skilling, with consequent displacements and shifts to part-time work, the more predominant trend is multi-skilling. Most firms surveyed by the Ontario Task Force on Employment and New Technology expect that workers will need more skills and more training to achieve proficiency in their jobs. There is also a strong consensus that good basic skills in reading, writing and mathematics and interpersonal and communications skills are becoming much more important for all workers because of the introduction of new hard-process technologies. Innovations in workplace organization similarly require an increase in the skills of workers. They must become more proficient in problem-solving and team work as responsibility is shifted from the individual worker to working groups or work stations.

There will be an increase in the use of office automation technology in the immediate future, but a shift toward greater utilization of process technology is foreseen for the next several years, a shift that has important implications for skills development. It will require placing a higher priority on technology-driven training, with the number of employees using robots, automated inspection and quality control and computer-aided design expected to more than triple over the 1985-1990 period.

A greater diffusion of electronic-based process technologies will require more training in blue-collar occupations. This training tends to be complex and, in many cases, involves a mixture of classroom and on-the-job training, rather than on-the-job training alone.

The widening use of process technology will require the labour force, both new entrants and existing members, to be functionally literate and to possess good analytical, inter-personal and communication skills. Higher levels of formal education will increasingly become a prerequisite for people whose jobs require them to work with computer-based technologies, so the extent of investment in basic literacy training, as well as in other forms of skills development, is expected to increase significantly over the next several years.

Employers will be called on to make a greater investment in training in response to the increased introduction of process technology and more sophisticated office automation systems. In assessing the adjustment of workplaces to the introduction

of office automation over the past several years, the Economic Council observed that "most innovating establishments appear to have adjusted to changing labour requirements without serious problems"[45] -- even though a large percentage of the firms that had adopted technology over the 1980-1985 period indicated that it had resulted in the creation of new jobs or substantially altered existing ones. This finding is attributable to the importance placed on training by these companies to facilitate worker adjustments: a mere 7 per cent used recruiting only; 34 per cent used a combination of retraining and recruiting; and a full 59 per cent used retraining only. The fact that retraining is the adjustment mechanism most often chosen by firms for dealing with the impact of technological change is supported by an Ontario Manpower Commission study conducted in 1984, which found that about 90 per cent of the establishments which had recently experienced changes in staffing arrangements because of technological change had used on-the-job training to help employees acquire the skills they needed to work with the new equipment or processes.[46]

Although the Council found that retraining was used extensively by employers in making technological innovations in the workplace, it also found that the training which took place was of relatively short duration and not overly costly, partly because much of the innovation introduced during the period studied was relatively uncomplicated office technologies. The training was usually informal and unstructured, integrating computer technology with existing vocational skills; in fact, the typical retraining necessitated by technological change was on-the-job training for clerical workers, and it usually lasted less than ten weeks.

Over the next several years, with the greater use of process technology, which will largely affect workers on the shop floor, retraining is expected to become longer, more formal and more structured in nature, calling for an even greater commitment to workplace training by employers.

It must be concluded then, that the heightened scale and complexity of technological innovations foreseen will require employers to make a greater financial investment in training for managerial, professional and technical personnel to assist in the innovative process and in training for direct production workers, who will require new skills to work with the technology. Without these investments in training, employers will encounter substantial difficulties in investing in the new forms of technology that will be needed for survival in a competitive marketplace. As noted in a recent article in The Globe and Mail: "One factor that determines the long-term profitability of any company is its willingness to adopt new technology. Another is a company's ability to harness and adapt technology in the workplace. The challenge is clear -- to manage these two factors carefully."[47]

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[45]ECC, Innovation and Jobs in Canada, p. 81.

[46]Ontario Manpower Commission, Training in Industry: A Survey of Employer-Sponsored Programs in Ontario (Toronto: The Commission, 1986).

[47]"Automation: A Mixed Blessing for Many Firms", The Globe and Mail, January 4, 1988, p. B6.

APPENDIX I

List of Shortage Occupations, Ontario, 1987

Management Occupations, construction operations
- Construction manager

Accountants, auditors and other financial officers
- Accountant

Draughting occupations
- Draughtsman/woman, general
- Computer-assisted design draughtsman/woman
- Detail draughtsman/woman
- Draughtsman/woman, electronic
- CAD applications for drafting

Architectural and engineering technologist and technicians
- Architectural technologies
- Chemical-engineering technologist
- Electrical-engineering technologist
- Electronic-engineering technologist
- Industrial-engineering technologist
- Mechanical-engineering technologist
- Metallurgical-engineering technologist
- Chemical-engineering technician
- Civil-engineering technician
- Electrical-engineering technician
- Electronic-engineering technician
- Industrial-engineering technician
- Mechanical-engineering technician
- Robotics-engineering technician

Systems Analysts, computer programmers and related occupations
- Systems analyst, business, electronic data-processing
- Systems analyst, engineering-scientific, electronic data-processing
- Systems-software programmer
- Programmer, business
- Programmer, engineering and scientific
- Application programmer
- Tool programmer, numerical control
- Computer graphics specialist
- Computer hardware specialist
- Minicomputer/microcomputer specialist

Occupations in welfare and community services
- Visiting homemaker

Supervisors, nursing occupations
- Nurse, supevisor

APPENDIX I (Continued)

Nurses, graduate, except supervisors
- Nurse, general duty

Registered nursing assistants
- Registered nursing assistant

Physiotherapists, occupational and other therapists
- Occupational therapist
- Physiotherapist

Pharmacists
- Pharmacist, hospital
- Pharmacists, retail

Denturists, dental hygienists, dental assistants and dental technicians
- Dental hygienists

Other occupations in medicine and health (n.e.c.)
- Inhalation-therapy technician

Technical sales occupations and related advisers
- Technical salesperson, electronic equipment
- Technical salesperson, industrial machinery and equipment

Sales workers, commodities (n.e.c.)
- Salesperson, parts

Insurance sales occupations and agents
- Salesman, insurance

Supervisors, food and beverage preparation and related service occupations
- Managing supervisor, dining establishment

Chefs and cooks
- Chef-cook, general
- Head chef
- Cook, small establishment
- Cook, foreign foods
- Cook, first
- Cook, therapeutic diet

Child-care occupations
- Children's nurse, private household

Mining and quarrying including oil and gas field occupations (n.e.c.)
- Drift-miner

APPENDIX I (Continued)

Baking, confectionery making and related occupations
- Baker

Slaughtering and meat cutting, canning, curing and packing occupations
- Butcher, all-round
- Meat cutter

Knitting occupations
- Knitting-machine fixer

Forging occupations
- Tool and die maker
- Mould maker

Machinist and machine-tool setting-up occupations
- Patternmaker, metal
- Machinist, model maker
- Grinder set-up operator, jig
- Machine-tool setter
- Machine-tool set-up operator
- Machinist, automotive
- CNC machinist
- Machinist, general
- Maintenance machinist
- Gear-cutting machine set-up operator
- Boring-mill set-up operator, horizontal
- Boring-mill set-up operator, vertical
- Drill-press set-up operator, multiple-spindle
- Drill-press set-up operator, tape-control
- Engine-lathe set-up operator
- Grinder set-up operator, precision
- Grinder set-up operator, thread
- Milling-machine set-up operator
- Tape-control-machine-tool set-up operator
- Turret-lathe set-up operator
- Tool grinder
- Screw-machine set-up operator

Machine-Tool operating occupations
- Machine-tool operator, production

Metal machining occupations (n.e.c.)
- Saw repairer

Sheet-Metal workers
- Sheet-metal worker

Metalworking-Machine operators (n.e.c.)
- Metalworking-machine setter

APPENDIX I (Continued)

Welding and flame cutting occupations
- Welder-fitter
- Welder, pressure vessels
- Welder, combination
- Welder, arc
- Welder, gas
- Welder, gas-shielded arc
- Welding technician

Boilermakers, platers and structural-metal workers
- Structural-metal fabricator
- Fitter, structural metal
- Metalworking-machine set-up operator

Wood patternmaking occupations
- Patternmaker, wood
- Model maker, wood

Planing, turning, shaping and related wood machining occupations
- Woodworking-machine set-up operator

Patternmakers and mouldmakers (n.e.c.)
- Model maker
- Patternmaker, plaster

Industrial, farm, construction and other mechanized equipment and machinery fabricating and assembling occupations (n.e.c.)
- Machine builder

Electrical and related equipment installing and repairing occupations (n.e.c.)
- Electrical repairer (industrial electrician)
- Electrical, automotive
- Refrigeration mechanic
- Repairer, electric motor
- Repairer, major appliance
- Repairer, electrical instruments
- Repairer, electric tool

Electronic and related equipment installing and repairing occupations (n.e.c.)
- Computer equipment repair
- Repairperson, electronic-equipment

Inspecting and testing occupations: Fabricating, assembling, installing and repairing electrical, electronic and related equipment
- Tester, systems

APPENDIX I (Continued)

Radio and television service repairers
- Television repair serviceman

Cabinet and wood furniture makers
- Cabinetmaker

Upholsterers
- Upholsterer, all around

Moulding occupations, rubber, plastic and related products
- Plastics-moulding-machine setter
- Extruding-machine operator

Motor-Vehicle mechanics and repairers
- Motor-vehicle mechanic
- Industrial-truck mechanic
- Truck-trailer repairer
- Body repairer

Aircraft mechanics and repairers
- Aircraft mechanic

Industrial, farm and construction machinery mechanics and repairers
- Printing-machinery mechanic
- Heavy-duty equipment mechanic
- Loom fixer
- Millwright
- Metalworking-machinery mechanic
- Sewing-machine mechanic
- Farm-equipment mechanic
- Construction-equipment mechanic
- Diesel mechanic

Business and commercial machine mechanics and repairers
- Office-machine repairer

Mechanics and repairers, except electrical (n.e.c.)
- Field serviceman
- Repairer, small engines
- Hydraulic-unit repairer

Marine craft fabricating, assembling and repairing
- marine-engine mechanic
- Outboard-motor mechanic

Painting and decorating occupations, except construction
- Wood finisher
- Spray painter, finish, large

APPENDIX I (Continued)

Excavating, grading and related occupations
- Heavy-equipment operator

Construction electricians and repair workers
- Air-conditioning mechanic, commercial
- Refrigeration and air-conditioning mechanic
- Electrician, construction and maintenance

Wire communications and related equipment installing and repairing occupations
- Communications electrician

Inspecting and testing occupations: electrical power, lighting and wire communications equipment erecting, installing and repairing
- Electrical-testing technician

Carpenters and related occupations
- Carpenter
- Framer

Brick and stone masons and tile setters
- Bricklayer
- Tile setter

Plasterers and related occupations
- Plasterer
- Dry-wall applicator

Pipefitting, plumbing and related occupations (n.e.c.)
- Plumber
- Gas fitter

Other construction trades occupation (n.e.c.)
- Maintenance mechanic, factor or mill
- Floor layer

Printing press occupations
- Offset press operator
- Flexographic pressman

Photoengraving and related occupations
- Stripper-layouter

Stationary engine and auxiliary equipment operating and maintaining occupations
- Stationary engineer

APPENDIX II

Labour Force Projections for Ontario: 1996
-Data Sources and Methodology-

This note briefly describes the data sources and methodology used in the projections of Ontario's labour force by age and sex for 1996.

Data Source

Population Projections. The population estimates by age and sex for Ontario for 1996 were taken from projections prepared by the Economic Policy Branch of the Ministry of Treasury and Economics.[1] Among the five scenarios reported in the Demographic Bulletin, scenario 4, which combines the high migration assumption with the medium fertility assumption, was chosen by considering the recent announcement of immigration levels by the federal government and the increasing trend of the net in-migration from other provinces.

Members of the Armed Forces. Estimates of the armed forces for 1996 were based on an assumed constancy of the number in each age-group at the levels indicated by the 1981 Census.

Indians Living on Reserves. The number of Indians living on reserves projected for 1996 is based on projections prepared by Statistics Canada for Indian and Northern Affairs Canada.[2]

Inmates of Institutions. Inmates of institutions by age and sex for 1996 were estimated on the assumption that the proportions of the population of each age-sex group that is institutionalized, as reported in 1981 Census, will remain constant.

Methodology

The projections of the labour force by age and sex involved the following three steps:

1. Estimating the labour force source population by age and sex. The labour force source population for 1996 was estimated by excluding members of the armed forces, Indians living on reserves, and inmates of institutions from the projected working age population (people 15 years of age and over).

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[1] Economic Policy Branch, Ministry of Treasury and Economics, "Ontario Population Projections, 1986-2006", Demographic Bulletin, June 1987.

[2] J. Perreault, L. Paquette, and M.V. George, Population Projections of Registered Indians, 1982 to 1996 (Ottawa: Indian and Northern Affairs Canada, February 1985).

APPENDIX II (Continued)

2. Projecting the labour force participation rates. The projections of labour force participation rates for 14 age-sex groups were made by examining the historical participation rate series for Ontario, Canada and the United States and a number of other countries of the Organization for Economic Co-operation and Development; by reviewing projections made by the Bureau of Labor Statistics for the United States; and by evaluating the effects of changes in fertility patterns and unemployment rates, as well as economic conditions, on future participation rates in Ontario. In projecting female labour force participation rates by age group, the gap values between the female and male rates were evaluated and long-term trends were extrapolated.

3. Projecting the labour force by age and sex. The projections of the labour force by age and sex were obtained by applying the projected participation rates to the projected source population.